NPS-ME-96-004

# NAVAL POSTGRADUATE SCHOOL
## Monterey, California



**A Combined (USN/USCG) Patrol Corvette (CPCX)**

by

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May 1996



Prepared for: Naval Postgraduate School
Monterey, CA 93943

NAVAL POSTGRADUATE SCHOOL
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# REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188



1. AGENCY USE ONLY (Leave blank)

2. REPORT DATE
May 10, 1996

3. REPORT TYPE AND DATES COVERED
Technical (7/95-12/95)

4. TITLE AND SUBTITLE

A Combined (USN/USCG) Patrol Corvette (CPCX)

5. FUNDING NUMBERS

6. AUTHOR(S)

Prof. C. N. Calvano; CDR M. A. Witt, USN; LT Eric Anderson, USN; LT John Comar, USCG; LT Jim Hurley, USCG

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Naval Postgraduate School
Monterey, CA 93943

8. PERFORMING ORGANIZATION REPORT NUMBER

NPS-ME-96-004

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

The views expressed in this report are those of the author and do not reflect the officical policy or position of the Department of Defense or the United States Govt.

12a. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for public release; distribution is unlimited.

12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

A Systems Engineering approach to the preliminary design of a combined-usage (USN/USCG) corvette is presented. The design responds to recognition that as lawbreakers become more sophisticated and heavily-armed, the Coast Guard's law enforcement operations become more similar to warfare; and at the same time, the Navy's increasing involvement in Operations Other than War (OOW), such as sanction enforcement and humanitarian operations, is becoming more like traditional law enforcement operations. The design, responding to this situation, pursues two variants of a single basic ship -- one with a Coast Guard payload and one with a Navy combat payload. Major objectives of the design are (1) cost savings by permitting larger numbers of the ship to be built than either service, alone, would need, with a high degree of commonality between the two variants and (2) provision of the ability to rapidly reconfigure the Coast Guard variant into the Navy variant when there is an expectation of increased combatant ship needs. Mission analysis, payload selection, development of measures of effectiveness and analysis of Naval Architecture features, as well as other design factors, are addressed.

14. SUBJECT TERMS

Ship Design, corvette, Navy, Coast Guard, conversion

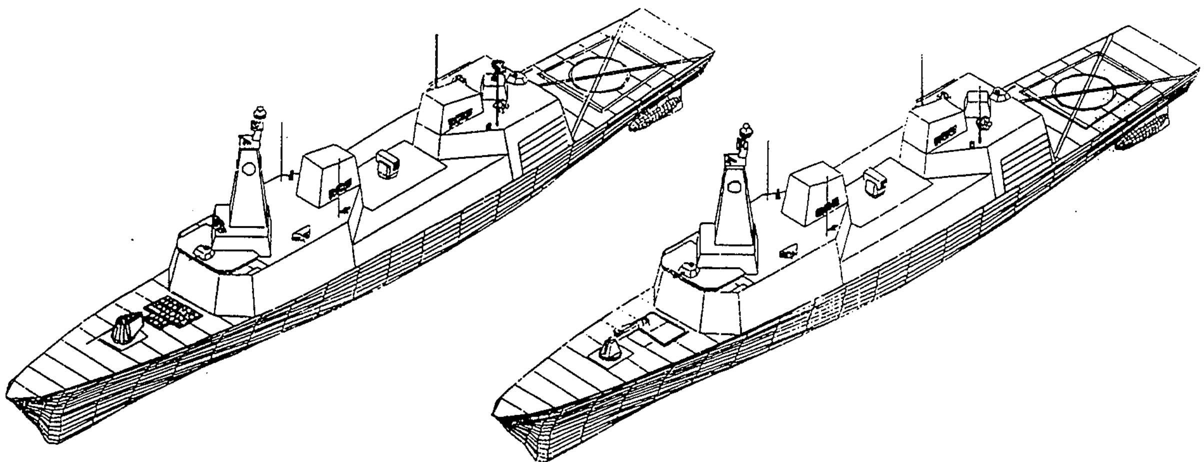
15. NUMBER OF PAGES
433

16. PRICE CODE

| 17. SECURITY CLASSIFICATION OF REPORT | 18. SECURITY CLASSIFICATION OF THIS PAGE | 19. SECURITY CLASSIFICATION OF ABSTRACT | 20. LIMITATION OF ABSTRACT |
|---|---|---|---|
| UNCLAS | UNCLAS | UNCLAS | |

# COMBINED PATROL CORVETTE

# CPCX



NAVY COAST GUARD

Total Ship Systems Engineering

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May 1996

## The Combined Patrol Corvette (CPCX)

This report documents a Total Ship Systems Engineering capstone design project undertaken by students at the Naval Postgraduate School, under the direction of Prof. C. N. Calvano, assisted by CDR M. A. Witt, USN. The design team consisted of: LCDR Jay Renken, USN; LT Eric Anderson, USN; LT Bob Armstrong, USN; LT John Comar, USCG; LT Jim Hurley, USCG; LT Helen Kilty, USCG; LT Thomas Jean, USN and LT Bob Jones, USN. These officer students all contributed to the performance of the design project over a six month period. The present report, however, represents a significant re-work of the team's design project report, hence the listed authorship of Calvano, Witt, Anderson, Comar and Hurley.

## Abstract

A Systems Engineering approach to the preliminary design of a combined-usage (USN/USCG) corvette is presented. The design responds to recognition that as lawbreakers become more sophisticated and heavily-armed, the Coast Guard's law enforcement operations become more similar to warfare; and at the same time, the Navy's increasing involvement in Operations Other than War (OOW), such as sanction enforcement and humanitarian operations, is becoming more like traditional law enforcement operations.

The design, responding to this situation, pursues two variants of a single basic ship -- one with a Coast Guard payload and one with a Navy combat payload. Major objectives of the design are (1) cost savings by permitting larger numbers of the ship to be built than either service, alone, would need, with a high degree of commonality between the two variants and (2) provision of the ability to rapidly reconfigure the Coast Guard variant into the Navy variant when there is an expectation of increased combatant ship needs. Mission analysis, payload selection, development of measures of effectiveness and analysis of Naval Architecture features, as well as other design factors, are addressed.

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# I. REQUIREMENTS PHASE

## A. MISSION NEED STATEMENT/FACULTY GUIDANCE

The following was provided by the faculty as guidance for this Total Ship System Engineering design project.

### *1. World View*

The United States will continue to find itself faced with a threatening world, but one in which the nature of the threat is unpredictable. The following characteristics are expected to mark the world the U.S. must face in the timeframe 2000-2020:

(a) Major, all-out oceanic Naval warfare will remain unlikely.

(b) Regional conflicts among and between "third world" nations will be likely.

(c) International (U.N., NATO) organizations will attempt to maintain world peace and order and U.S. forces will operate under control of such organizations.

(d) Operations other than war (OOW) (trade interdiction, embargo, port closure, humanitarian relief, peacekeeping patrols, etc.) are likely employment for U.S. ships.

(e) Budgets will remain extremely tight; the lack of a clear cut threat to the existence of the United States will make it difficult to obtain defense funding.

(f) Pressures to decrease the size of the federal government and of the armed forces will continue, causing consolidations of roles for the armed forces.

(g) Proliferation of high-technology weapons among nations will continue.

(h) Law enforcement at sea (anti-drug, anti-piracy, etc.) will get more frequent and be conducted against more sophisticated and more heavily-armed criminals.

(i) The "CNN effect" will continue to make it vital to reduce the likelihood and numbers of U.S. (and even enemy) casualties.

### *2. Background*

There has been a lengthy national debate, involving the Congress, the State Department, DOD, other Executive Branch departments and the White House. It has been decided to proceed with a ship design and procurement that has the following characteristics.

(a) There will be two variants of the ship. One will be operated by the Navy for its role in littoral operations and OOW; one will be operated by the Coast Guard in increasingly challenging law enforcement scenarios. It is noted that as the Navy does more OOW, its operations begin to look more like law enforcement; and that as the Coast Guard takes on more sophisticated and richer criminals, its operations will begin to look more like war. Hence a convergence toward a ship which can, at least in part, meet both needs has strong political attractiveness.

(b) As much as possible of the two variants will be kept the same, to reduce costs and ease production. The variants will differ where that is made necessary by their different missions.

(c) Keeping costs down is of great importance because it is intended to buy these ships in large numbers. There is a significant consensus that "small" is desirable.

(d) To keep costs down, and reduce the risk to human life, the crews are to be small as feasible for the ships' size and equipment.

(e) The ships are to use automation and other high technology approaches to make them survivable.

(f) Initial Operational Capability (IOC) is to be 2010.

### *3. Guidance*

The following is general guidance from senior levels in the Navy and Coast Guard.

Navy Variant:

(a) Will be fully deployable and fleet-compatible. The Coast Guard version will be

capable of easily being made so.

(b) Will be operating in the presence of AEGIS combatants and, therefore, do not need an area AAW capability.

(c) Must be capable of operating effectively in the littoral environment, with specific capabilities defined by the Operational Requirements Document.

(d) Must be capable of independent as well as battlegroup operations; in the Coast Guard role, the ships will operate in one or two ship groups.

Coast Guard Variant:

(a) Must be capable of detecting, intercepting and, if necessary, defeating well-equipped drug smugglers and pirates who may have the resources to purchase significant militarized equipment. Specific capabilities will be defined in the Operational Requirements Document.

(b) Will be used to interdict illegal immigration and smuggling.

(c) Must perform search and rescue.

Conversion:

(a) It would be desirable to be able, quickly and cheaply, to convert one variant into the other, with a short (less than four weeks) shipyard availability. The design must provide for this conversion as much as is possible.

### *4. Amplifying Information*

The Coast Guard wants a ship whose primary uses will be drug, smuggling, and illegal immigration interdiction (board and search), fisheries protection, search and rescue, escort, navigation, and survey and general maritime police duties. Low maintenance and support costs is a primary concern.

The Navy wants a robust self defense capability, some strike capability and sophisticated air search capabilities. Low observability for special operations and operations in the littoral is considered a necessity. Helicopter capabilities will be essential and multi-mission considerations are expected to govern. The ship will support amphibious operations, perform choke point clearance and function as an alternative mine hunter. Cooperative Engagement Capability and the ability to operate in the rapidly-changing littoral environment are essential. A radar that handles land clutter well without losing low/slow targets is essential.

The applications of new technologies and concepts such as interlinking ship control, administration, combat systems, $C^4$ I data, training and control systems are desirable. The concept of human casualty avoidance possibly through reduced crew sizes, which in turn require excellent organic training capabilities, is an important feature to be considered for incorporation into the ship system.

## B. OPERATIONAL REQUIREMENTS DOCUMENT

### *1. Description Of Operational Capability*

The system is defined as a Combined Patrol Corvette (CPCX) suitable for use by either the Coast Guard or the Navy. The ship will be required to operate in an all weather environments year-round in all oceans of the world, particularly in littoral waters. Transit of ice covered waters is not required. Two variants will be designed and each will be convertible into the other in a shipyard availability.

The Navy variant will provide independent forward presence and operate as an integral part of joint and allied maritime expeditionary warfare operations. CPCX will launch and support precision strike weapons and will provide firepower support for amphibious and other ground forces. The ship will protect itself and friendly forces against air, surface, and subsurface threats. CPCX will perform escort duties of other military and civilian craft. The ship will conduct and support special operation forces

worldwide. The ability to conduct blockade operations will be required. The ship will perform board and search operations, choke point clearance, picket and patrol duties and will function as an alternative mine hunter. The ship will maintain sea lines of communication and will protect and enforce the freedom of navigation of US and allied vessels in the navigable waters of the world. Coastal intelligence gathering will be conducted by the ship. Humanitarian assistance in the form of at sea rescues, emergency medical care, sustenance and protection will be provided. CPCX will be capable of both humanitarian evacuations and those resulting from military action. The ship will perform search and rescue (SAR) operations involving people and property.

The Coast Guard variant will primarily conduct SAR and Enforcement of Laws and Treaties operations. Humanitarian assistance in the form of at sea rescues, emergency medical care, sustenance and protection will be provided. The ship will detect, intercept, and defeat drug smugglers and pirates. It will also interdict illegal immigration and smuggling. Fisheries protection, escort, safety of navigation, survey, and general maritime police duties will be carried out by the Coast Guard variant. Coastal intelligence gathering will be conducted by the ship. Port security duties in the form of searching and boarding vessels will be performed. The ship will carry and station small navigational buoys. The ship will assist in the containment of oil spills. The Coast Guard variant will be capable of joining the Naval fleet in joint operations and in time of war.

### *2. Threat Summary*

While traits of projected threats cannot be predicted exactly, reasonable threat estimates can be made by identifying projected threat environments, extrapolating data from current weapon systems, and examining possible technologies for future weapon systems.

Major all-out oceanic warfare will remain unlikely while regional conflicts among and between third world nations will occur. Limited warfare in the littorals requires different resources than currently exist. Operations other than war such as trade

interdiction, embargo, port closure, humanitarian relief, and peacekeeping are expected. Proliferation of high technology weapons among nations will continue. Encountering more sophisticated and heavily armed criminals will be commonplace.

Future weapon systems include missile threats that, when compared to today's weapon systems, will be smaller, faster, capable of flying at lower or higher altitudes, will have smaller radar cross sections, and improved targeting and avoidance systems. Gun threats include guided as well as unguided projectiles that will be challenging to detect, engage, and defeat. Threats will also include combined arms attacks intent on eroding ship self-defenses and removing offensive capabilities.

Specific projected threats categorized by threat environments are as follows:

(1) Law Enforcement (Independent operations - ship operating independently in littoral waters):

| | |
|---|---|
| Small arms | - 20 mm and smaller bullets (armor piercing). |
| Projected grenades | - 40 mm explosive and chemical. |
| Mortar | - 80 mm explosive and chemical. |
| Guns | - 76 mm, 20 km range. |
| Missiles | - Mach 2.0, -40 dB, 3 km range. |

(2) Low Intensity Conflict (Independent and Group operations - ship(s) operating jointly in littoral waters):

| | |
|---|---|
| Small arms | - 20 mm and smaller bullets (armor piercing). |
| Projected grenades | - 40 mm explosive and chemical. |
| Mortar | - 80 mm explosive and chemical. |
| Guns | - 76 mm, 20 km range. |
| | - 127 mm, 28 km range. |
| Missiles | - Various flight profiles |
| | - Mach 2.0, -40 dB, 3 km range. |
| | - Mach 3.0, -35 dB, 100 km range. |
| | - Mach 1.5, -30 dB, 200 km range. |

| | |
|---|---|
| Mines | - Bottom or moored, -25 dB. |
| Torpedoes | - 100 knots, -30 dB, 7.5 km range. |

(3) Major Regional Conflict (Force operations - operating as a junior member of an amphibious or carrier battle group task force in littoral or deep waters).

| | |
|---|---|
| Guns | - 76 mm, 20 km range. |
| | - 127 mm (unguided), 30 km range. |
| | - 127 mm (guided), 30 km range. |
| ETC guns | - 127 mm (rocket assisted), 110 km range. |
| Missiles | - Various flight profiles |
| | - Mach 2.0, -40 dB, 3 km range, dual mode seeker. |
| | - Mach 3.0, -35 dB, 100 km range. |
| | - Mach 1.5, -30 dB, 200 km range, dual mode seeker. |
| | - Mach 4.0, -20 dB, 700 km range. |
| Mines | - Bottom or moored, -25 dB. |
| Torpedoes | - 100 knots, -30 dB, 7.5 km range. |

### *3. Shortcomings Of Existing Systems*

Current ship designs are inadequate to meet the needs of the Navy and Coast Guard into the 21st century. Existing ship designs such as the Navy's Spruance, Kidd and Perry classes and the Coast Guard's Hamilton, Reliance and Bear class cutters will reach the end of service life before the year 2010. A new surface combatant is necessary to maintain the required surface combatant force level capable of countering the 2010 and beyond threat.

Present ship designs were built for open ocean battle group operations, with strong steady logistic support, and defense in depth. These ships were not designed to operate for extended periods far from the strength and support of the battle group. Our current

fleet is being taxed by the need to provide global forward presence in littoral waters with limited numbers of ships.

Present designs employ an inflexible architecture that prevents timely and cost effective updates and reconfigurations. Shortfalls include obsolete computers and software, with the inability to introduce subsystems into an effective total ship system. These shortfalls make current designs vulnerable to threats from advanced aircraft, small fast surface craft, mobile and fixed land-based weapon systems, and submarines.

Current designs have large manning requirements but have inadequate ship self-defense systems to protect the ship and its crew from close in attack. Shortfalls in accuracy, reaction time, target discrimination, and kill assessment create vulnerabilities. Mines and diesel submarines are cheap, viable threats that must be countered. Present ships have no mine avoidance capability and their active and passive sonar systems are designed for open ocean operations. They are vulnerable to attack from mines, torpedoes, and anti-ship missiles making them "*littorally challenged.*"

### *4. Range Of Capabilities Required*

#### BOTH VARIANTS

CPCX must be able to operate independently in its patrol area. The ship must be fully interoperable with other Naval expeditionary, interagency, joint and allied forces. The ship must maneuver in formation at sustained Naval expeditionary force speeds in excess of 25 knots (kts). The ship will have a minimum range of 8000 nautical miles (nm) at a cruise speed of 14 kts. The ship must be able to perform seamanship, airmanship, and navigation tasks and to prevent and control damage. Underway fueling at sea capability is required as well as the ability to provide fuel to an astern rig. The ship must be able to embark and support armed rotary-wing aircraft, and conduct rotary-wing aircraft operations. The ability to stop, board and disable other vessels is required. CPCX will have a reduced electronic, magnetic, thermal, and acoustic signature to achieve low observability. A sensor suite able to operate in both open ocean and close to land with

minimal detection degradation is required. The communications suite must have an integrated database capable of interfacing in a Joint Task Force/Combined Task Force (JTF/CTF) environment to include compatibility with joint systems such as the Global Command and Control System (GCCS) and the Joint Worldwide Intelligence Communications System (JWICS). The ship must have a full suite of radios and antennas to support full connectivity via EHF/SHF/UHF/SATCOM. The ship must be able to support the equipment and personnel of a mine disposal system. Weather deck connections for temporary sewage and sanitation facilities must be provided. In water personnel rescue is required from the ship. The ship will be capable of providing routine health care, first aid assistance, triage, and resuscitation, to include care of evacuees numbering 50% of crew size. Towing capability is needed for seized vessels up to 10,000 LT displacement. Multi-purpose ship's small boats will be readily deployable, have a minimum capacity of 8 people, and be able to perform in waters up to sea state 4. Modularized mission specific items for future updates will be used and will lend toward quick conversion between variants. Minimization of crew size while maintaining capability is essential.

NAVY VARIANT

The ship must destroy or neutralize enemy targets afloat and ashore through the use of coordinated, precision strike weapons. The ship must be capable of performing ship self defense against foreign military enemies and civilian terrorists at sea and in port. The ship must be capable of conducting engagements cooperatively with other ships, submarines, aircraft, space systems, and land systems. The ship must detect and chart underwater mines. The ship must detect, identify, and engage air, surface, and underwater threats. The ship must capable of defending itself against raids comprised of 3 ASCMs arriving within a one minute interval.

COAST GUARD VARIANT

The ship must destroy or neutralize enemy targets afloat and ashore. The ship must be capable of performing ship self defense against foreign military enemies and

civilian terrorists at sea and in port. The ship must be capable of conducting engagements with other ships, military and civilian aircraft, and land systems. The ship must detect and chart underwater mines. The ship must detect, identify, and engage air and surface threats. Capability to transport and station small navigational buoys is required. A system for prisoner containment will be provided.

### 5. *Integrated Logistic Support (ILS)*

The ultimate goal of the logistic support system will be to develop a "paperless" ship, one that is able to devote 100% of its personnel and equipment to its assigned missions. The CPCX will be designed with a squadron type basing system. This will simplify the logistic support planning and requirements.

Maintenance Planning: The CPCX will incorporate minimum-manning concepts wherever possible. The onboard crews will be expected to perform routine, recurring minor maintenance (less than 3 hours per individual task) and casualty repairs while underway. Shore based Maintenance Augmentation Teams (MAT) will assist the ship's force with non-depot level maintenance and repairs while the CPCX is in port. MATs shall incorporate both contract and government personnel. The maintenance philosophy will consist of the Preventative Maintenance System (PMS) and Condition Based Maintenance System (CBMS). CBMS shall be implemented to the greatest extent possible using the technology available.

Depot level repair: Systems shall be designed for extended cycles between depot level availabilities. A 5 year drydocking cycle with one pierside availability near the halfway point shall be the minimum major maintenance intervals.

Support Equipment: All combat and HM&E systems shall include built-in diagnostic capabilities to reduce troubleshooting man-hours. Artificial intelligence driven trouble-shooting systems are to be included with all combat and HM&E systems. Tools required for onboard maintenance and repair shall be available on CPCX. This shall

include a small machine shop for emergency repair (underway) functions. The use of special tools required for maintenance and repair shall be minimized.

Human Systems Integration: The use of minimum-manning requires each crewmember to be trained for multiple skills. Pipeline and/or squadron training facilities shall be utilized to reduce on-the-job training (OJT) requirements for primary skills. This will enable OJT to be utilized for cross-training. Combat systems and HM&E systems (to the greatest extent possible) shall incorporate individual and team training functions without external support.

Computer Resources: Software shall be written using existing languages with code length and storage requirements minimized to the greatest extent possible. Hardware shall consist of militarized Commercial-Off-the-Shelf (COTS) equipment wherever possible, militarized only as required. Components chosen shall be open systems compliant.

Other Logistic Considerations: Provisioning shall be consistent with current Navy/Coast Guard policy at the time of implementation. Home port piers shall be designed to moor at least one half of a six-ship squadron at all times. Adequate office space shall be provided for squadron staff, consistent with the goals of this system, the "paperless ship".

### *6. Infrastructure Support and Interoperability*

The CPCX shall be designed as a squadron supported ship. It will be based in large groups (6 or more). The CPCX will depend on its squadron staff for the bulk of its administration, maintenance, planning, contracting, supply, training ,and personnel functions thereby minimizing manning requirements on the ships.

The CPCX shall be designed with standardization (within ship class) as a priority. The ability for a rapid reconfiguration between the Navy and Coast Guard variants is desired. Commonality with existing US and NATO systems to the greatest extent possible is highly desired.

### *7. Force Structure*

The introduction of a corvette sized hull with modular combat systems suitable for mission tailoring for combined Navy and Coast Guard use would require a change in the mindset of ship-counters. These combined service corvettes are not suited to be one for one replacements for ships of the line such as DDG-51 class destroyers and CG-47 class cruisers and will not be expected to fulfill all the missions of an Aegis fleet. CPCX cannot be viewed as one for one replacements for the DD-693 and FFG-7 classes because of differences in the types of missions required in the littoral regions of the world.

Although the CPCX would not be a direct replacement for current combatants, ship class life cycle comparisons provide a basis for the future force structure. In 2005 the DD-963 hull will have completed 30 years of service and will be nearing the retirement phase of the Spruance and Kidd Classes (35 hulls 1200 officers, 11,100 crew). In 2007 the FFG-7 will have completed 30 years of service and will be nearing the retirement phase of the Oliver Hazard Perry Class (51 hulls, 1000 officers, 10,000 crew). In 2013 the CG-47 will have completed 30 years of service and will either be upgraded to extend their life cycle or begin the retirement phase of the Ticonderoga Class (27 hulls, 900 officers, 10,000 crew). In 2011 the DDG-51 will have been in service for 20 years and will still have at least 10 years of service remaining for the Burke Class (28 hulls, 644 officers, 7,840 crew). With the retirement of the non-Aegis ships and the high cost of the Aegis platforms, the CPCX would be ideally suited to perform independent or small group operations in the littorals or support battle group or amphibious group operations.

In view of this information, the integration of the CPCX into the Navy should be in proportion to the number of major combatants in service which would include aircraft carriers, large deck amphibious ships (LHD's, LHA's, and LPD's), cruisers and destroyers. It is estimated that the future major combatant fleet size in 2010 will be approximately 120 hulls. In consideration of the future fleet size, a two one ratio of major combatants to the CPCX is appropriate. This will result in 60 CPCX hulls for Navy use.

The Coast Guard's need for a new ship class is more pressing than the Navy's need. The Coast Guard's ships are older, and therefore will require a significantly higher percentage of maintenance and financial resources. In 1997 the WHEC-715 hull (Hamilton class 378 ft HEC) will have completed 30 years of service (12 hulls 250 officers, 1,870 crew). All twelve hulls were modernized between 1988 and 1992 and the class can be expected to be operational for a 40 year hull life. In 1994 the WMEC-615 hull (Reliance class 210 ft MEC) will have completed 30 years of service (16 hulls 130 officers, 870 crew). All sixteen hulls where modernized between 1989 and 1994 and the class can be expected to be operational for a 40 year hull life. In 2013 the WMEC-901 hull (Bear class 270 ft MEC) will have completed 30 years of service (13 hulls 143 officers, 1365 crew). Service life could easily be extended to 35 years with proper maintenance and planning. In view of the age and time in service of the above classes it is proposed that they be replaced by the CPCX as the new hulls become available. The current Coast Guard force would be replace by 40 CPCX's.

The production strategy for CPCX is to construct two hulls (one Navy variant, one Coast Guard variant) in 2009 for acceptance trials and testing resulting in delivery in 2010. A second hull of each variant will be produced by the same yard or yards the following year to validate production processes prior to commencing full production of the class. It is expected that the production run will last between 10 and 15 years. A total of 100 ships would be built resulting in the construction of 7 to 10 hulls per year. The first five years of production should be 8 units per year divided 5-3 in favor of the Coast Guard. This will help alleviate financial and manning strains on the Coast Guard and will help to keep production costs down in the early part of the production run. After five years the number of hulls constructed will be 25 Coast Guard variants and 15 Navy variants. The second five years of production should continue at 8 units per year in a 6-2 split in favor of the Navy. This will allow continued modernization of the Coast Guard fleet and timely retirement of non-Aegis combatants. After ten years the number of hulls constructed will be 35 Coast Guard variants and 45 Navy variants. The last five years of production will complete the production run with 4 hulls per year and a 3-1 split between Navy and Coast Guard. The total number of hulls constructed will be 40 Coast Guard variants and 60

Navy variants. A replacement for Aegis platforms will probably start production around the year 2020 reducing the funds available for the CPCX program.

### *8. Schedule Considerations*

The ship will be considered fully operational after acceptance trials, and completion of Post-Shakedown Availability (PSA), as well as having all support and maintenance facilities in place and operable.

A projected timeline for design and production processes is as follows:

| | |
|---|---|
| Present - 2002 | Feasibility studies and Preliminary Design |
| 2003 | Contract Design |
| 2004 | Bid process |
| 2005 | Award contract |
| 2006 | Detail Design and begin construction |
| 2010 | Deliver First ship (testing and PSA complete) |
| | Every 5 years review and update design |
| 2025 | End production |
| 2050 | Begin decommissioning |

The ships crew and squadron will stand up approximately one year prior to delivery to begin the precommisioning process. All personnel required to attend critical rate schools prior to reporting will complete training pipelines no less than 6 months prior to ship delivery. The remaining period prior to delivery will be used for on the job training, team trainers, and training with mockups or with actual shipboard equipment when possible.

Shore based maintenance and logistics facilities and systems will be in place 6 months to a year prior to ship delivery.

### *9. Cost Considerations*

Cost is one of the primary factors concerning the design of this class of ship. The high costs of current combatants preclude their use to satisfy the mission defined for the littoral regions. The CPCX must be a more cost effective system for dealing with littoral warfare. The missions required of this ship will dictate that ship self defense will be of the highest priority. This along with the desire to automate systems while maintaining a robust ship self defense capability will tend to increase the acquisition costs. Reduced manning, however, should lead to lower operational costs and fewer potential personnel casualties. In view of these points it is intended that this ship type will be significantly less expensive than the current Aegis platforms being constructed. The ship price (averaged over the production run) may not exceed $450 Million (Navy variant) or $375 Million (CG variant), 1995 dollars. The displacement may not exceed 4000 LT (either variant).

# II. FEASIBILITY STUDY/COMBAT SYSTEM SELECTION

## A. INTRODUCTION

The design team was given the task of designing two separate ships, one Navy Variant and one Coast Guard Variant. Each variant must be easily convertible into the other, meet the design constraints in terms of weight and cost, and satisfy the requirements as defined by the Operational Requirements Document (ORD). The team divided into two sub-teams: a U.S. Navy team, and a U.S. Coast Guard team, with each team consisting of both Navy and Coast Guard members. The following chapter outlines the feasibility study which was conducted to measure the suitability of the CPCX design for service in the Navy and Coast Guard.

The first task was to develop "threat scenarios" based on expected future threats. While the traits of future threats cannot be projected exactly, reasonable threat estimates can be determined by identifying projected threat environments, extrapolating data from current weapon systems, and examining possible technologies for future weapon systems. The expected threats were broken down into service specific threat scenarios. A threat level and opportunity analysis was done to assist in prioritizing the emphasis on specific warfare areas for each design. These threat scenarios are included in Appendix (A).

The design constraints, specific design requirements, and projected threat summary provided the bases for the Combat System selection. The following sections provide a detailed analysis of the Combat System selection process including: Combat System elements considered, method of element selection, trade-off studies, option analysis, measures of effectiveness, and final design recommendations.

## B. COMBAT SYSTEM REQUIREMENTS

The requirements set forth in the ORD were reduced to reflect requirements which pertained to Combat Systems and separated into three areas; common requirements for both variants, Navy specific requirements, and Coast Guard specific requirements. These Combat Systems requirements are included in Appendix (B).

## C. FUNCTIONAL ALLOCATION

A functional allocation table was developed to link each operational requirement to a specific warfare area and functional area. The Combat System requirements listed in Appendix (B) were broken down into functional and warfare areas. Functional areas include: Detection, Control and Engagement. The warfare areas include: Anti-Air Warfare (AAW), Anti-Submarine Warfare (ASW), Anti-Surface Warfare (ASuW), Mine Warfare (MIW), Strike Warfare, Amphibious Warfare (AMW), Enforcement of Laws and Treaties (ELT), Search and Rescue (SAR), and Other Than Warfare (OTW). These nine warfare areas are a subset of each functional area which linked each specific requirement in the ORD to a warfare and functional area. Table (1) contains an example of a functional allocation table. Under each warfare area, The functional allocation tables were used as a tool to ensure all requirements are satisfied and each warfare function will be performed by at least one element in the Combat System suite.

## D. COMBAT SYSTEM ELEMENTS

The threat scenarios and functional analysis guided the team toward general Combat System areas. Six warfare/Combat System areas were investigated: Guns, ASW sonars, air/surface search sensors, missiles, mine hunting devices, and small boats. These investigations were conducted by two-person "mini"-teams (consisting of one member from each parent team). The mini-teams compiled lists of data on existing systems and systems under development. The lists for some of the sensor and engagement systems are included in Appendix (C). This raw data was examined and used to evaluate the identified systems in terms of performance, ship impact, cost, and convertibility. A detailed system trade-off study was conducted in two areas: sonar and air search radars.

## E. TRADE-OFF STUDY: SONAR

Sonar selection for the CPCX was a difficult problem. The Navy obviously needed some sort of active sonar but the Coast Guard did not want a sonar system. The desire to use the same hull for both variants and the difficulties of installing or removing a hull mounted sonar drove the selection toward a smaller hull mounted system or some sort of

| Elements | AAW | | | | | | ASW | | | | ASUW | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Vol Search | ESM | IR | Visual | Organic | Inorganic | Active | Passive | Organic | Inorganic | Surf Search | ESM | IR | Visual | Organic | Inorganic |
| | | | | | | | | | | | | | | | | |
| Oper. Requirements | | | | | | | | | | | | | | | | |
| A1 | | | | | | | | | | | | | | | | |
| A2 | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| A3 | | | | | | | | | | | | | | | | |
| A4 | | | | | | | | | | | X | X | X | X | X | |
| A5 | | | | | X | | | | X | | | | | | X | |
| A6 | | | | | X | | | | X | | | | | | X | |
| A7 | | | | | | | | | | | | | | | | |
| A8 | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| A9 | | | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| B1 | | | | | | | | | | | | | | | | |
| B2 | | | | | | | | | | | | | | | | |
| B3 | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| B4 | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| B5 | X | X | X | X | X | | | | | | | | | | | |
| B6 | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| B7 | | | | | | | | | | | | | | | | |

| Elements | MIW | | | STW | | AMW | | | ELT | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ship Board | Organic | Inorganic | Organic | Inorganic | Visual | Organic | Inorganic | Vol. Search | Surf Search | ESM | IR | Visual | Organic | Inorganic |
| | | | | | | | | | | | | | | | |
| Oper. Requirements | | | | | | | | | | | | | | | |
| A1 | | | | | | | | | | | | | | | |
| A2 | | | | | | | | | X | X | X | X | X | X | |
| A3 | | | | | | | | | | | | | | | |
| A4 | | | | | | | | | X | X | X | X | X | X | |
| A5 | | | | X | | | X | | | | | | | X | |
| A6 | | | | X | | | X | | | | | | | X | |
| A7 | | | | | | | | | | | | | | | |
| A8 | X | | | | | | | | X | X | X | X | X | X | |
| A9 | | | | | | | | | | | | | | | |
| A10 | X | X | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| B1 | | | | X | | | | | | | | | | | |
| B2 | | | | | | X | X | | | | | | | | |
| B3 | | | | | | | | | | | | | | | |
| B4 | | | | | | | | | | | | | | | |
| B5 | | | | | | | | | | | | | | | |
| B6 | | | | | | | | | | | | | | | |
| B7 | X | X | | | | | | | | | | | | | |

| Elements | SAR | | | | | | | OTW | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Vol. Search | Surf Search | ESM | IR | Visual | Organic | Inorganic | Vol. Search | Surf Search | ESM | IR | Visual | Organic | Inorganic |
| | | | | | | | | | | | | | | |
| Oper. Requirements | | | | | | | | | | | | | | |
| A1 | | | | | | | | | | | | | | |
| A2 | X | X | X | X | X | X | | X | X | X | X | X | X | |
| A3 | | | | | | | | | | | | | | |
| A4 | | | | | | | | | | | | | | |
| A5 | | | | | | X | | | | | | | X | |
| A6 | | | | | | X | | | | | | | X | |
| A7 | X | X | X | X | X | X | | X | X | X | X | X | X | |
| A8 | X | X | X | X | X | X | | X | X | X | X | X | X | |
| A9 | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| B1 | | | | | | | | | | | | | | |
| B2 | | | | | | | | | | | | | | |
| B3 | | | | | | | | | | | | | | |
| B4 | | | | | | | | | | | | | | |
| B5 | | | | | | | | | | | | | | |
| B6 | | | | | | | | | | | | | | |
| B7 | | | | | | | | | | | | | | |

Table 1 - Functional Allocation, Detection, Navy

removable system. With this logic in mind two major options were selected for the active sonar system. The hull mounted SQS-56 and an active towed array system called ATAS.

To analyze the active capabilities of the two systems a sample detection scenario was used and range detection predictions were calculated. The target of interest was a submarine with a Target Strength of 15 dB, at a depth of 150 meters in water 2000 meters deep. Assumptions made for the analysis included 50% probability of detection and straight ray path propagation. It was realized that the constant velocity sound propagation is not realistic but this was the best tool available for analysis. Actual propagation paths will be addressed in the discussion of the system selected. Factors considered in the calculation included; spreading losses, reverberation, ambient noise levels, array characteristics, power level, and geometry. The calculation spread sheets are included as Appendix (D) . The Signal Excess for the SQS-56 system is positive to a range of 30,000 meters while the Signal Excess for the ATAS is positive in excess of 40,000 meters.

The ranges from the sonar analysis are not important in themselves, but they do show that the ATAS outperforms the SQS-56. Another factor not considered in the model was self noise. The towed array system would see much less self noise than the hull mounted system which would improve the towed array's performance relative to the hull system. Another major consideration for the selection is the effect of velocity profile on prediction ranges. Because the propagation paths will not be straight, both systems should experience performance degradation. The degradation of the hull mounted system performance should be much greater than that of the towed array system because the hull mounted system operates above the surface layer while the towed system has the capability to be lowered to a depth of 300 meters. Based on this sonar analysis, the ATAS has better performance characteristics.

## F. TRADE-OFF STUDY: RADAR

A table of detection ranges for various radars against the incoming threat missiles was created. To analyze radar performance, the characteristics of each radar were entered into known radar equations to compute signal excess versus range plots. From the signal

excess plots and the radar cross section (RCS) of each threat missile, the maximum detectable range can be found. The table of detection ranges is located in Appendix (E).

The comparison of radar characteristics shows that a radar such as a SPY-1D with 5 MW of peak power has the longest detection range and can detect an incoming missile at the greatest range. This provides more time for the CPCX to react and defeat the incoming missile threat. A radar such as the SPS-49 has much less power output and shorter range detection capability. Power output is an important characteristic in the detection of a high flying or beam centered (CL) target. The detection of a sea skimming (SS) target is much more difficult than the detection of a high flyer. The sea skimming target is masked by the earth's curvature and its detection range is based primarily on the CPCX's height of radar. A height of 20 meters was used for all radar calculations.

Two radars which stand out in this analysis are the SPY-1D and XPAR or X-band Phased Array Radar. The XPAR is similar in design to a SPY-1D but operates with an X band frequency. The reduced size and weight of the XPAR are more compatible with a small ship design such as the CPCX. In addition, the X-band phased array design operates at a higher frequency and offers improved resolution over the S-band SPY-1D in open ocean and littoral environments.

## G. MEASURES OF EFFECTIVENESS (MOE)

Measures of effectiveness were developed for each vital mission area as determined from the ORD. Each MOE provided a relative gauge of the Combat System capability with respect to cost in a specific mission area. A description of each MOE is located below.

The strike MOE equates the parameters used for the number of strike missiles ($N_M$), range (R), ability to target ($P_T$), circle error probability (CEP), ship cost (CS) and the number of missiles needed for a kill ($N_K$). The strike MOE evaluated the CPCX's capability to launch long range strike missiles against land targets. The Coast Guard Variant was not evaluated with this MOE because it was not expected to carry out strike warfare missions.

$$\text{Strike MOE} = \frac{N_M * R * P_T}{CEP * CS * N_K}$$

The air engagement MOE equates the parameters used for defense efficiency (DE), probability of kill given a hit for the ship ($P_{K/H}$), ship cost (CS) and the number of air defense missiles ($N_M$). The air engagement MOE evaluated the CPCX's capability to defend itself against enemy missiles. Both variants were evaluated with this MOE based on the threat of missile attack.

$$\text{Air Engagement MOE} = \frac{1-[DE * P_{k/h} * N_M]}{CS}$$

The sub-surface engagement MOE equates the parameters used for number of vertically launched ASROC or VLA ($N_A$), range of VLA ($R_A$), number of surface vessel torpedoes ($N_S$), range of surface vessel torpedoes ($R_S$), effectiveness of MK 50 torpedo ($P_K$), and ship cost (CS). The sub-surface engagement MOE evaluated the CPCX's capability to defend itself against an underwater submarine threat. The Coast Guard Variant was not evaluated with this MOE based on little need for ASW detection capability.

$$\text{Sub-surface Engagement MOE} = \frac{[(N_A * R_A) + (N_S * R_S)] * P_K}{CS}$$

The Naval Gun Fire Support (NGFS) MOE equates the parameters used for number of guns ($N_G$), range of gun fire in kilometers ($R_G$), weight of each round (W), number of rounds ($N_R$), circle error probability (CEP), and ship cost (CS). The NGFS MOE evaluated the CPCX's capability to provide gun fire support. There was no requirement for the Coast Guard Variant to have a large caliber gun so the Coast guard Variant was not evaluated with the NGFS MOE.

$$\text{NGFS MOE} = \frac{N_G * R_G * W * N_R}{CEP * CS}$$

The patrol area MOE equates the parameters used for search width in nautical miles (W), velocity in knots (V), search time in hours (T), area of search in square nautical miles (A), and ship cost (CS). The patrol area MOE evaluated the CPCX's capability to effectively search large areas of ocean.

$$\text{Patrol Area MOE} = \frac{1-\left\{\left[e^{-(W*V*T/A)}\right]_{ship} + \left[e^{-(W*V*T/A)}\right]_{helo}\right\}}{CS}$$

The convertibility MOE equates the relative difficulty involved in the conversion of each major job. A numerical factor will be assigned to each major conversion job based on its estimated completion time. The scale below shows the weighting factors (RD) with the respective cutoff times:

RD=0.25 - Critical path job with estimated completion time greater than 14 days.
RD=0.50 - Non-critical path job with estimated completion time greater than 14 days.
RD=0.75 - Non-critical path job with estimated completion time greater than 7 but less than 14 days.
RD=1.00 - Non-critical path job with estimated completion less than 7 days.

The product of these conversion factors is the convertibility MOE which was evaluated for both Variants. Each Variant is required to be convertible to the other in a four week period.

$$\text{Convertibility MOE} = RD_1 * RD_2 * RD_3 * \ldots RD_n$$

The ship signature MOE equates the parameters used for ship displacement (LT), estimated stack temperature in degrees Celsius (T), estimated machinery plant noise in decibels (N), and ship cost (CS). The ship signature MOE evaluated the CPCX's susceptibility to acoustic and infrared detection.

$$\text{Ship Signature MOE} = \frac{1}{D*T*N*CS}$$

The boarding MOE equates the parameters used for number of boarding parties ($N_P$), number of small boats ($N_B$), Availability of boats ($A_B$), and ship cost (CS). The boarding MOE evaluated the CPCX's capability to conduct boarding operations.

$$\text{Boarding MOE} = \frac{N_P * N_B * A_B}{CS}$$

## Table 2 - Navy Variant Whole Ship Options

| | Option 1 | Option 2 | Option 3 |
|---|---|---|---|
| **Radar** | SPY-1D | XPAR | SPS-49 |
| | SPS-67 | SPS-67 | SPS-67 |
| | TAS | - | TAS |
| **ASW Sonar** | SQR-19 | ATAS | SQR-19 |
| | SQS-56 | - | - |
| **Mine Sonar** | SH-100 | SH-100 | SUTEC DOUBLE EAGLE |
| **Passive Element** | SLQ-32 | SLQ-32 | SLQ-32 |
| | VIDEO/OPTICAL | VIDEO/OPTICAL | VIDEO/OPTICAL |
| | IR Mk-46 | IR MK-46 | IR MK-46 |
| **Helicopter** | PANTHER | PANTHER | PANTHER |
| **Small Boats** | 4 | 2 | 2 |
| **MFCS** | MK 99 | MK 99 | - |
| **Illuminator** | SPG-62 | SPG-62 | - |
| **GFCS** | Mk 34 GFCS | Mk 34 GFCS | MK 86 GFCS |
| **GFCS Radar** | SPG-60/SPQ-9 | SPG-60/SPQ-9 | SPG-60/SPQ-9 |
| **ASW System** | SQQ-89 | SQQ-89 | SQQ-89 |
| **ASW FCS** | Mk-309 ASWFC | Mk-309 ASWFC | |
| **Command & Decision** | VOICE COMMS | VOICE COMMS | VOICE COMMS |
| | GPS | GPS | GPS |
| | TACAN | TACAN | TACAN |
| | IFF | IFF | IFF |
| | WCS | WCS | WCS |
| | ACDS | ACDS | ACDS |
| | CEC | CEC | CEC |
| | JMICS | JMICS | JMICS |
| **Air Defense System** | ISDS | ISDS | ISDS |
| **Large Gun** | 155 mm | 127 mm | 127 mm |
| **Small Gun/Point Defense** | (2) CIWS | (2) 40 mm | (2) 40 mm |
| **Launcher** | Mk 49 (RAM) | Mk 49 (RAM) | MK49 (RAM) |
| **AA Missile** | RAM | RAM | RAM |
| **Launcher** | - | - | CANNISTER |
| **Anti Ship Missile** | HARPOON | HARPOON | HARPOON |
| **Launcher** | VLS | VLS | ABL |
| **Strike Missile** | TOMAHAWK | TOMAHAWK | TOMAHAWK |
| **AA Missile** | ESS | ESS | - |
| | SM-2 MR | SM-2 MR | - |
| **ASW rocket** | VLA | VLA | - |
| **Torpedo Launcher** | SVTT | SVTT | SVTT |
| | MK 50 | MK 50 | MK 50 |
| **Decoy** | SRBOC | SRBOC | SRBOC |
| | NIXIE | NIXIE | NIXIE |
| **Mine Disposal** | EOD TEAM | EOD TEAM | EOD TEAM |

## Table 3 - Coast Guard Variant Whole Ship Options

| | Option 1 | Option 2 | Option 3 |
|---|---|---|---|
| **Radar** | SPY-1D | XPAR | SPS-49 |
| | SPS-67 | SPS-67 | SPS-67 |
| | TAS | TAS | - |
| **ASW Sonar** | SQS-56 | - | - |
| **Mine Sonar** | SH-100 | SH-100 | SUTEC DOUBLE EAGLE |
| **Passive** | SLQ-32 | SLQ-32 | SLQ-32 |
| | VIDEO/OPTICAL | VIDEO/OPTICAL | VIDEO/OPTICAL |
| | IR Mk-46 | IR Mk-46 | IR Mk-46 |
| **Helicopter** | DOLPHIN | DOLPHIN | DOLPHIN |
| **Small Boats** | 4 | 4 | 3 |
| **GFCS** | MK 92 GFCS | GFCS | GFCS |
| **GFCS Radar** | CAS/STIR | GFCS RADAR | GFCS RADAR |
| **ASW System** | SQQ-89 | - | - |
| **ASW FCS** | Mk-309 ASWFC | - | - |
| **Command & Decision** | VOICE COMMS | VOICE COMMS | VOICE COMMS |
| | GPS | GPS | GPS |
| | TACAN | TACAN | TACAN |
| | DATA FUSION | DATA FUSION | DATA FUSION |
| | WCS | WCS | WCS |
| | ACDS | ACDS | ACDS |
| | CEC | CEC | CEC |
| | JMCIS | JMCIS | JMCIS |
| | IFF | IFF | IFF |
| **Air Defense System** | ISDS | ISDS | ISDS |
| **Large Gun** | 76 MM | - | - |
| **Small Gun/Point Defense** | CIWS (1) | (2) 40 mm | (1) 40 mm |
| **Launcher** | Mk 49 (RAM) | Mk 49 (RAM) | - |
| **AA Missiles** | RAM | RAM | STINGER |
| **Torpedo Launch** | SVTT | - | - |
| **Torpedo** | MK 50 | - | - |
| **Decoy** | SRBOC | SRBOC | SRBOC |
| | NIXIE | NIXIE | NIXIE |
| **Buoy Handling** | CRANE and STOWAGE | CRANE and STOWAGE | CRANE and STOWAGE |
| **Mine Disposal** | EOD TEAM | EOD TEAM | EOD TEAM |

The overall MOE equates the individual MOEs discussed above with an individual weighting factor for the relative importance of that MOE against the other MOEs. The equation below shows the overall Measure of Effectiveness:

$$MOE_{overall} = \sum MOE_i * WF_i$$

## H. WHOLE SHIP OPTIONS

The functional allocation requirements and individual system evaluations were used to define three whole Combat System suite options for the CPCX. These whole ship options are shown in Table (2) for the Navy Variant and Table (3) for the Coast Guard Variant. The Combat System elements chosen for each whole ship option were analyzed on the basis of satisfying operational requirements and performing warfare functions in the detect, control, engagement sequence. The functional allocation tables for each whole ship option are contained in Appendix (F). Each whole ship option has varying capabilities and cost, but all options satisfy the requirements in the ORD and defeat the projected threats.

## I. ELEMENT VS. ELEMENT INTERFACES

The Combat System suite for each whole ship option was placed in a table to develop the architecture for each suite. Each specific element was linked to other elements in the system by means of either an electrical, data, mechanical, or logical interface. These interfaces show how the whole system will be connected and provide a basis on which to develop the Combat System architecture. The systems chosen drove the Combat Systems architecture or Ring Information Network (RIN). The network is depicted in Figure (1), which shows how the information from outside the loop is used to make decisions inside the loop and then flows back out to be implemented. The Element Interface Tables are included in Appendix (G).

## J. ELEMENT VS. SHIP SUPPORT SYSTEM

A table of ship support systems for each Combat System element was developed. The first of three whole ship options was used to generate the table, which is included as

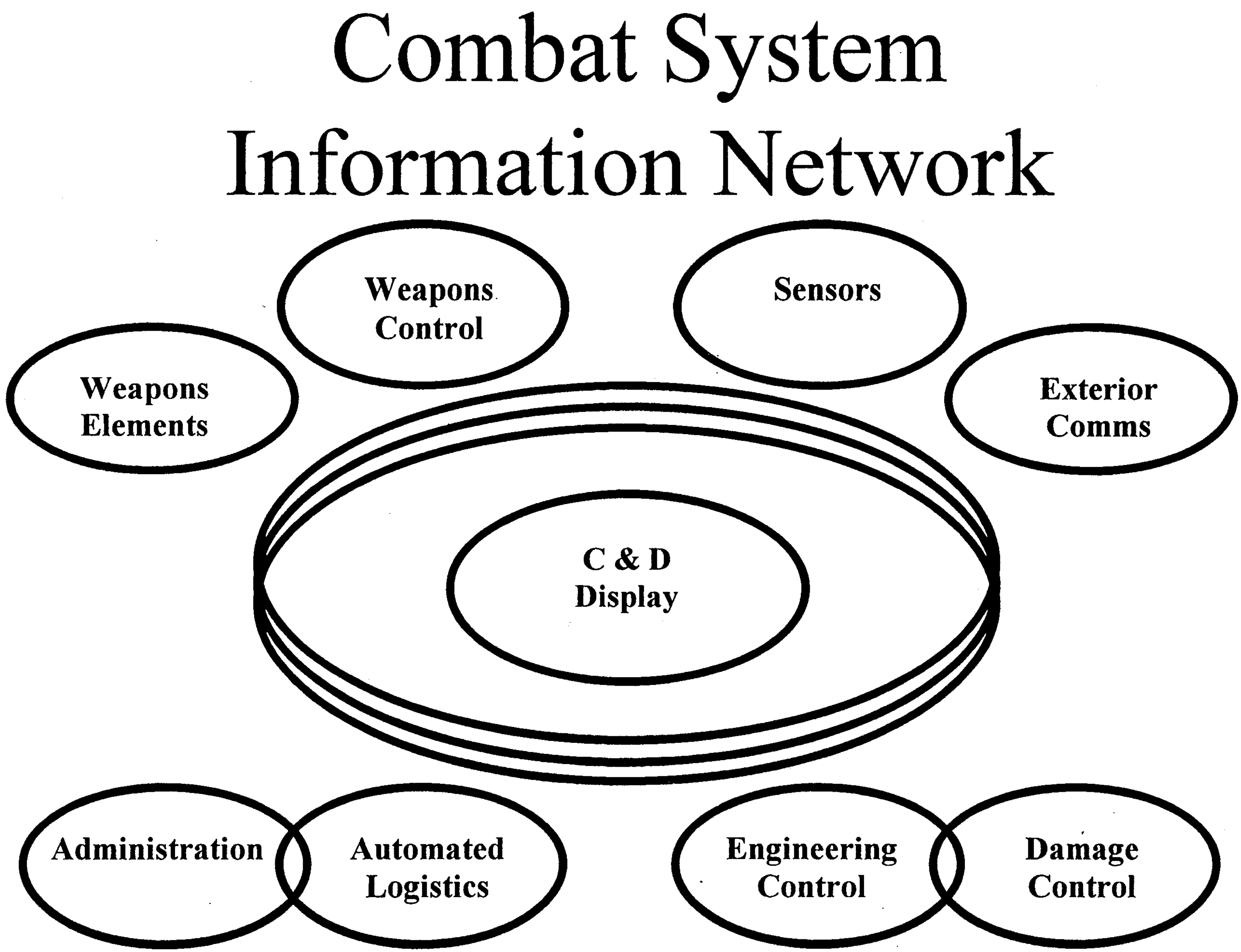



Figure 1. Combat System Architecture - Ring Network

Appendix (H). This ship option had the most equipment and the other options could be characterized as a subset of the first ship. For the most part, the support system interfaces were determined from experience and the TS4000 course notes. Almost all of the elements required electric power. The shipboard electric distribution system is not specified. It could be either AC or DC. The type of electric power is only specified for 400 Hz power. The 400 Hz power is used mainly in topside equipment to reduce the size and weight of motors.

During the preliminary design of a single ship option, the exact requirements for each system will be investigated to determine the capacity required for the individual support systems. The shipboard electric distribution will be finalized and sized to allow for growth and emergency backup capacity.

## K. ELECTROMAGNETIC INTERFERENCE (EMI):

To provide a basic gauge of which systems are likely to induce or be subjected to EMI, a table of operating frequencies was developed. This table is included as Appendix (I). The EMI table shows the frequency band where each Combat System element operates. The L and X frequency bands contain most of the Combat Systems elements and are the areas most likely to experience EMI. The X band is shared by the surface search radar, fire control radars and SHF communication frequencies. The L band is shared by the TAS, IFF, TACAN and VHF/UHF communication frequencies.

## L. ANALYSIS OF OPTIONS

After researching Combat System suites and choosing three whole ship options, each option was again dissected to come up with the "best" choice. The following tools were used for this process: Warship 21, self-defense engagement scenarios, and MOE analysis.

### *1. Warship 21 Analysis:*

Warship 21 provided initial cost and size data. Each option's payload was entered into Warship 21 along with a standard propulsion and electrical plant that met the ORD

requirements of sustained speed and range. The program provided cost data which was used as input for the MOEs. The printouts from Warship 21 are included in Appendix (J).

### 2. Self-Defense Engagement Scenarios:

Engagement scenarios were completed on each option to determine whether the combat systems payload could meet the prospective threats as defined by the ORD. Defense efficiencies were calculated from the engagement scenarios. Self-defense data is included in Appendix (K). This data includes a sample engagement description, summary table of defense efficiencies, and the individual engagement diagrams.

### 3. MOE Analysis:

The MOEs described earlier were used to quantify the relationship between each whole ship option. Data collected from individual system characteristics, Warship-21, and self-defense engagements were used with the MOE equations to determine which ship option was most effective in each mission area. Weighting factors were then used to indicate relative importance of each mission area and the overall MOE for each option was calculated. A summary of the MOE tables are contained in Appendix (L). The highest overall MOE was used to select the recommended Combat System payload for each variant.

## M. RECOMMENDATION, NAVY

All three whole ship options met or exceeded survivability requirements and are feasible. The balance of requirements and costs led to the conclusion that the "Option Two" vessel was the best solution to the diverse requirements established by joint inter-operability, convertibility, survivability and broad utility as reflected in the MOEs. Option One, which included high-end systems offered increased capability but at a higher cost, which approached the maximum ship cost leaving no margin for unforeseeable costs. Option Three, which included low-end systems appeared to meet all requirements and was rapidly convertible but lacked significant offensive payload. The chosen option offers a formidable weapon payload capable of effective self-defense against sea skimming

missiles, strong offensive firepower to strike targets tens of miles away, and rapid conversion to a Coast Guard Variant. The broad spectrum of possible options presented by modular combat systems allows the chosen option to be improved with future combat system upgrades as they become available. Option Two provides the most balanced design between cost and capability for a small naval combatant for the 21st Century.

## N. RECOMMENDATION, COAST GUARD

All three whole ship options met or exceeded survivability requirements and are feasible. The balance of requirements and costs led to the conclusion that the "Option Two" vessel was the best solution to the diverse requirements established by joint inter-operability, convertibility, survivability and broad utility as reflected in the MOEs. Option One, which included high-end systems, offered increased capability but at a higher cost which exceeded the maximum ship cost. This option also included a sonar system which is not necessary for the Coast Guard mission but was included to enhance convertibility in the event the Navy chose Option One. Option Three, which included low-end systems, appeared to meet all requirements but was more difficult to convert to an effective Navy variant. The chosen option offers a formidable weapon payload capable of effective self-defense against sea skimming missiles, adequate offensive firepower to conduct Enforcement of Laws and Treaties, and rapid conversion to a Navy Variant. The broad spectrum of possible options presented by modular combat systems allows the chosen option to be improved with future combat system upgrades as they become available. Option Two provides the most balanced design between cost and capability for a Coast Guard Cutter for the 21st Century.

# III. COMBAT SYSTEMS JUSTIFICATION

The following is a brief summary and justification of each combat system element included in the design.

## A. DETECTION SYSTEMS

### *1. Air Search Radar: XPAR (1)*

The X-band phased array radar (XPAR) incorporates most of the capabilities of a SPY-1D, in a scaled down version. XPAR's higher frequency allows the radar's dimensions and weight to be reduced significantly while it provides long range detection, tracking and over-the-land capability. It is capable of surface search, air search, fire control, and navigation. The non-rotating antenna design promotes stealthy architecture. The XPAR looks to the future as radars continue to get smaller and lighter.

The Navy variant was required to defend against three sea skimming missiles in a period of one minute. This requirement drove the need for a high performance radar that could detect this threat and provide an instantaneous fire control solution to fire weapons in defense. The Coast Guard variant was not faced with this same threat, but the XPAR was included as part of its Combat System suite to minimize conversion issues.

### *2. Surface Search Radar: SPS-67 (1) & Furuno (1)*

The SPS-67 will be employed as the primary surface search radar, with the primary navigation radar, the Furuno, as the backup. Both radars are currently in use on numerous naval craft surface craft and thus do not require any additional research and development or operational testing. The combination of these two radars provides for excellent navigation functions and target resolution in a modern, lightweight package.

*3. IR Search: MK 46 Electro-Optical detector (1)*

The MK 46 will be used for infrared detection and tracking. IR in combination with the video/optical system provides visual pictures during low light and adverse weather conditions. Additionally, the MK 46 can detect heat plumes of sea skimming missiles over the horizon, enhancing self defense capability.

*4. Helicopter: HH-65 Dolphin (1) USCG AS-565 Panther (1) USN*

The Dolphin is currently in use by the Coast Guard and many foreign navies. It is lightweight, compact and offers a good balance between long range capability and mission flexibility. The militarized version of the HH-65, Panther, will be utilized with the Navy variant. It is capable of carrying sonobuoys and torpedoes for ASW as well as air-to-surface missiles for surface engagements and over-the-horizon targeting.

*5. Identification: Identify Friend or Foe (IFF)*

IFF will be used as an identification system to differentiate enemy from friend. In today's and the future's battle situation, IFF will play a key role in preventing fratricide.

*6. ESM: SLQ-32(V)3 (2)*

The SLQ-32 is the standard system for active/passive electronic support in the U.S. Navy. It provides highly directional electromagnetic detection and jamming capability to enhance survivability characteristics.

*7. Sonar: Active Towed Array Sonar (ATAS) (1)*

ATAS provides the capability of an active hull mounted sonar with the flexibility and modularity of a tail which can be easily removed to meet conversion requirements. The lack of a required Coast Guard sonar capability along with the inherent

limited effectiveness of a hull-mounted sonar, eliminated the hull-mounted sonar from consideration. Other factors such as the extra weight, volume, cost and maintenance associated with a hull mounted sonar contributed to its elimination.

#### *8. Mine Sonar: SH-100 (1)*

The hull mounted SH-100 provides mine localization and identification up to 1000 meters. Additionally, it provides bottom mapping and survey capability. The SH-100 is retractable and accessible from within the ship for ease of operation and maintenance. The SH-100 is installed in both the Navy and Coast Guard variants.

### B. COMMUNICATIONS

#### *1. External Communications: (Misc.)*

The communications suite will consist of the following types of equipment: HF, UHF, VHF, and SATCOM. The ship will have the ability to access any and all strategic or tactical data networks, such as JMCIS or ACDS and CEC networks. Cooperative Engagement Capability (CEC) allows the CPCX to conduct engagements cooperatively with other ships. The goal is real time communication for worldwide connectivity.

#### *2. Internal Communications (Misc.)*

The interior communication system will consist of a fiber optic digital multiplexing system for voice and data distribution, with traditional sound powered phones and portable wire-free radios for damage control and emergency backup voice communications.

### C. WEAPON CONTROL SYSTEM

#### *1. Missile Fire Control System: MK 99 (1)*

The MK 99 MFCS uses the XPAR to control SM-2 anti-aircraft missiles in flight. This system is currently used by all Aegis cruisers and destroyers and will require little research and development to integrate the Mk 99 with the XPAR.

*2. Gun Fire Control System: MK 34 (1)*

The MK 34 fire control system allows the use of the XPAR as a gun fire control radar. This eliminates the need for additional radars, reducing cost and topside weight.

*3. Anti-Submarine Warfare Fire Control System: MK-309 (1)*

The ASW fire control system to be used with the ATAS, Vertical Launched ASROC (VLA), and Surface Vessel Torpedo Tubes (SVTT).

D. NAVIGATION SYSTEM

*1. Navigation radar: Furuno, GPS, TACAN (1 ea.)*

The Furuno radar is a commercial grade, low cost navigation radar. It was chosen over the SPS-64 because it is cheaper and easier to operate. It does, however, introduce an interface problem that needs to be solved. In addition, the Global Positioning System (GPS) will be used for accurate automated navigation. Portable GPS units will be used for small boat navigation. TACAN will be used for helicopter support.

E. ENGAGEMENT/WEAPONS

*1. Long Range Intercept Missile: SM-2 MR (12 cells), ESS (4 cells)*

After debating the various missile parameters, SM-2 was chosen for long range intercept of air targets. It offers accurate, long range capability and future upgrades and blocks within the standard missiles series will offer even greater capability including Theater Ballistic Missile Defense (TBMD). It is U.S. made and a standard on U.S. Naval

combatants. Enhanced Sea Sparrow (ESS) was chosen for intermediate engagements, thereby increasing the number of missiles carried and improving engagement flexibility. Both missiles are fully compatible with the vertical launching system.

*2. Short Range Intercept Missile: RAM (21)*

The Rolling Airframe Missile (RAM) was chosen as the short range missile for intercept of airborne targets. It offers passive IR and RF guidance and a trainable launcher for short range, high speed intercepts.

*3. Anti-Ship Missile: Harpoon (8 cells)*

The upgraded version of the Harpoon, featuring IR capability and VLS compatibility, will be used. The Harpoon offers long range anti-ship capability. The innovative feature of the missile is that it will be launched from the Vertical Launching System, thereby eliminating the need for a separate launcher.

*4. Land Strike Missile: Tomahawk (9 cells)*

The Tomahawk missile provides the capability to destroy or neutralize enemy targets ashore. It was chosen for the strike mission because of its high performance level and integration capability with VLS launcher.

*5. Point Defense System: Bofors L70 40mm gun (2)*

The 40mm guns serve dual purposes. They will be used for ultra-short range (point defense) airborne target intercept and in a more traditional sense as a self defense weapon against small surface targets. The need for a separate "CIWS" system is eliminated saving weight, space, and cost.

*6. Small Caliber Gun: Bofors L70 40mm (2)*

As stated above, the 40mm gun serves a dual purpose. The 40mm gun enhances the AAW point defense capability, improves self defense capability, and provides a meaningful weapon against small boats for boarding operations.

*7. Large Caliber Gun: 5"-54 MK 45*

The 5" gun provides the Navy variant with the capability to provide firepower support for amphibious and other ground forces. It is the standard U.S. large caliber gun for naval combatants and has the capability of accepting barrel and propellant source upgrades for future munitions.

*8. Torpedo: MK 50*

The MK 50 torpedo will provide the Navy variant with ASW engagement capability. It will be launched from the SVTT MK 32 torpedo tubes or with the Vertical Launch ASROC (VLA) launched from the VLS.

*9. Missile Launching System: Vertical Launch System (VLS)*

The VLS will hold SM-2, ESS, Tomahawk, Harpoon, and VLA missiles. This launcher configuration eliminates the need for additional launching systems. Topside space is made available and radar cross section is be reduced.

F. COUNTERMEASURES

*1. ECM: SRBOC, NIXIE, SLQ-32(V3) (Misc.)*

All available countermeasure systems will be used. The anti-missile versions will be launched using the MK 36 Super Rapid Bloom Offboard Countermeasures (SRBOC) Launcher. The SRBOC munitions provide protection against

missiles with active and passive radar and infrared homing systems. New countermeasures under development will be incorporated into the system.

# IV. PRELIMINARY DESIGN PHASE

## A. COMBAT SYSTEMS ARCHITECTURE

### 1. *Design Statement*

The CPCX Combat System and supporting elements are designed to meet the requirements delineated in ORD. Specifically, the combat system must:

(a) Provide anti-air self-defense against limited intensity threats;

(b) Provide anti-surface defense against third-world surface naval forces;

(c) Provide anti-submarine defense in deep and shallow water while employed independently;

(d) Provide firepower support for amphibious and other ground forces;

(e) Destroy or neutralize enemy targets afloat and ashore through the use of coordinated, precision strike weapons;

(f) Conduct engagements cooperatively with other ships, submarines, aircraft, space systems, and land systems;

(g) Detect and chart underwater mines;

(h) Defend itself against raids of 3 ASCM's arriving within a one minute interval;

(i) Be capable of joining the Naval Fleet in joint operations and during time of war;

(j) Provide coastal intelligence gathering.

### 2. *Top Level Design Goals*

Based on the above requirements, the top level combat system design goals are:

(a) self-defense;

(b) discriminate targets minimize unwanted damage;

(c) fight hurt--minimize damage by effective assessment and rapid restoration;

(d) continuous high readiness for extended periods;

(e) self-sufficient, capable of independent or small group operations;

(f) reduced manning;

(g) built in automatic reconfigurability of ship's based on evolving threat scenario/condition;

(h) built in fault identification with rapid repair capability; and

(i) combat system automation with preset options for layered self-defense.

### 3. *Combat System Description and Capability*

Figure 2 depicts the functional arrangements of the CPCX combat system. General design attributes include:

(a) Primary connectivity between elements is provided by a multi-channel, multi-redundant fiber optic ring bus. Envisioned is a series of five functionally redundant data buses geographically separated within the ship to decrease vulnerability. Each system has multiple channel capacity and each channel has the capability to carry multiplexed data. Determination of data types and flow that allow use of multiplexing vice dedicated channels must be determined during detailed combat system design. The application of the Fiber Optic Data Multiplexing System (FODMS) and Fiber Optic Interior Voice Communications System (FOIVCS) improves capability and enhances survivability while reducing ship acquisition cost, primarily via the associated weight and volume savings.

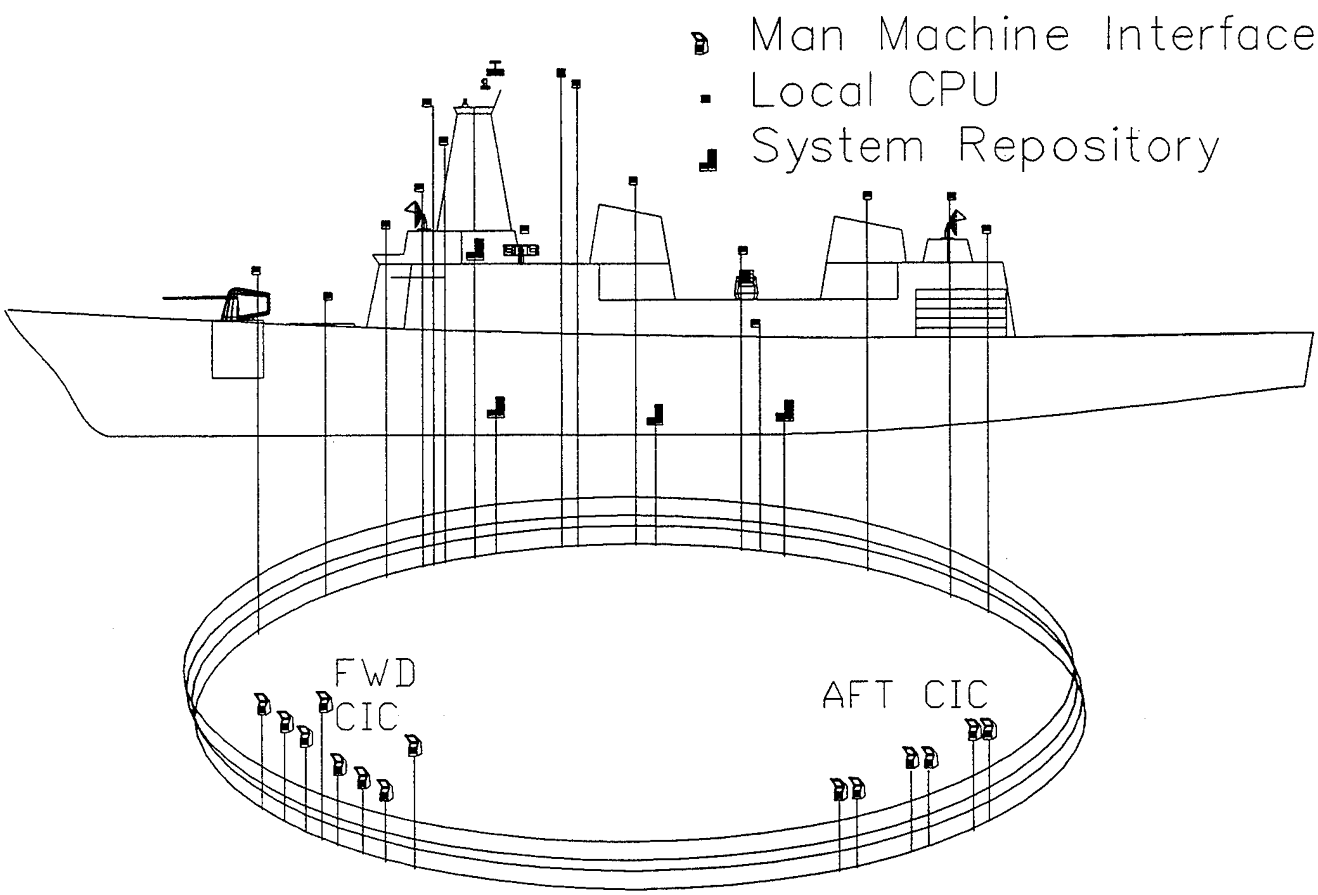



Figure 2 Ring Information Network Distribution

(b) The processing capabilities for all shipwide systems are distributed throughout the ship instead of being located in one central location. There will be no "central computer" in the traditional sense . The computer processing power required by all combat systems is distributed among the individual elements and linked by the fiber optic ring bus. This distributed processing capability provides redundant computational capacity and eliminates processing bottlenecks. The system will contain the following types of hardware:

(1) System Repository Units. These units perform the system control functions and provide the system software storage capability. There are four of these units distributed throughout the ship. This ensures that the system will have a control station in the event of a casualty to the system or battle damage.

(2) Multipurpose Man Machine Interface (MMI) Consoles. These represent generic, programmable operator interface consoles that provide the man/machine interface for the combat system elements or administrative data elements. These consoles are militarized versions of modern, commercial workstations. They allow the operator to access all information on the data bus and perform the watch station functions as required by the watch organization or administrative duty. Each MMI unit will contain processor hardware.

(3). Local element processing units. Each Combat System element will have a local processor unit designed to function primarily as the processor for that element. The system control station will have the capability to access the local processor to perform other system functions as necessary.

(c) The system is design to integrate not only the combat system elements, but also other functions vital to the ship's mission. Engineering and Damage Control stations will be included to automatically provide up to date equipment status to the decision makers. Automated logistics functions will be performed to reduce equipment

downtime and all administrative functions will be maintained electronically to eliminate paper.

(d) Two manned Combat Information Center (CIC) spaces are provided. CIC #1 is the primary control space and is supported by CIC #2. Although the spaces are designed to function as a single control unit, equipment functional redundancy is provided between the two spaces to allow a single space to function individually if necessary. The processing equipment, display panels and number of control operator stations are almost identical. The two CIC's are located in separate enclaves to improve survivability. The elements in the spaces utilize all available sensors and external information data stream to provide the necessary information to create a complete tactical picture.. The tactical picture created must be complete and coherent enough to provide necessary reaction time for ship defense. The major functions performed by the combat system elements are:

(1) Detection. These elements determine contact detection and develop basic track data on contacts. The elements exports the track data to the ring bus for distribution and use by other combat system elements. This function is performed by sensor equipment including, but not limited to AN/SPS-67 radar, X Band Phased Array radar, ATAS, AN/SLQ-32, Helicopter sensor suite, and all other passive or active elements.

(2) Control. These elements perform all control functions to go from contact detection to contact engagement. Track data from various detection elements on and off the ship is correlated and integrated into central track files. Track correlation contact parameters are initially fed into the ring bus. The next control functions are threat assessment as friendly, neutral, or enemy. The system then coordinates engagement decisions and sets the engagement priorities. Additionally, it coordinates own ship operations with the operations of other ships or aircraft in the task force. The system is capable of fully automated ship self-defense operation. The level of automation employed is determined by the Commanding Officer based on the tactical situation. Weapons selection and engagement coordination is also performed by these elements. The system maintains an inventory of available ordnance and carries out the engagement planning

needed for weapons release. The system coordinates the use of individual weapon elements to prevent interference between own ship weapons and damage to friendly forces. Following engagement battle damage assessment is also performed.

(3) Engagement. These elements deliver ordnance on target at the direction of the control elements. The necessary data for engagement is relayed by the ring bus. These elements are the guns, missile launchers, active countermeasures, torpedoes and all other similar systems.

(e) The power interface module provides the interface management function between the ship's engineering plant electric plant control module and the combat systems with regards to load shed command and coordination. The primary backup system is an uninterruptable power supply (UPS) which provides short term power backup. If there is continued loss of electrical generation capacity due to casualty, the electric plant control module sends a load shed command to the combat system, essentially conveying available generating and bus configuration. The interface module communicates with the control element to determine combat system needs commensurate with tactical situation. With a balance between power requirements (demand) versus generating capacity, the power system interface module transmits shut down commands to appropriate combat system elements and also communicates electric plant reconfiguration requests to the electric plant control module.

(f) Readiness assessment, fault detection and localization. The survivability management and readiness assessment (SM/RA) module works in conjunction with the various combat system element's built-in test and evaluation (BITE) capabilities to provide an integrated system readiness assessment. All the combat system elements must have this BITE capability. An additional BITE feature is the requirement that all combat system elements provide automated troubleshooting capability. This enhances fault localization and subsequent repair to place equipment fully operational in as short a time as practical. The readiness assessment sub-module provides the commanding officer (CO) and tactical action officer (TAO) with a real-time comprehensive assessment of the ship's ability to continue fighting. Additionally, it enables the

combat information center officer of the watch (CICO) and engineering officer of the watch (EOOW) to better coordinate efforts to maintain/recover mission readiness prioritized to current mission needs. The readiness data includes current status of mission capabilities, times to failure and times to recovery. Readiness data is obtained from all systems including auxiliaries that supply the individual combat systems.

(g) Survivability and reconfigurability. System survivability is enhanced by a number of design features, including:

(1) dual Control element functionality geographically separated in CIC #1 and CIC #2;

(2) multiple, distributed processing capabilities;

(3) multiple redundant connectivity between all combat system elements;

(4) graceful degradation of overall system capability due to power loss through the uninterruptable power supply and smart load shed management. With the available redundant/alternate functional capabilities, system reconfiguration is practical to optimize combat system employment during casualty conditions.

(h) Embedded training. The integrated combat system includes an embedded training module to allow realistic threat scenario engagement exercises. These training scenarios will exercise the control elements and watchstanders. Essentially, this entails the capability to run pre-programmed engagement scenarios by injection of track and other necessary data directly onto the data bus.

(i) Embedded support service management. Primary support services for the combat system are electrical, chilled water, sea water, ambient space cooling and high pressure air. With the zonal scheme, each zone has fully self-contained capability with the exception of

electrical power generation. Status of these systems is maintained by Damage Control Central (DCC) and the engineering plant status module. Support service configuration is coordinated with required combat system capability as determined by the tactical situation during casualty situations. Maximum capability will be maintained consistent with available capacity remaining during casualties. With input to/from the survivability management system, certain automatic damage control actions can be accomplished before a weapons hit occurs.

(j) Automated Communications Suite. To enhance manning reduction and increase external communications, the external communications suite is automated. This automation allows incorporation of the external communications function as an integral part of the integrated combat systems suite. Features such as automated electronic message routing with dispersed remote terminals streamline message dissemination. Automated external connectivity allows integration of the ship in a task force/battle group scenario. Export of sensor data and import of weapon command functions to extend the integrated fighting power of the task force/battle group. Import of real time data from outer sources provides a coherent, integrated picture of the battle space. With continuously updated information, the ship could support or be supported by other ships, engaging targets its own sensors cannot detect.

## B. HULL, MECHANICAL AND ELECTRICAL (HM&E) ARCHITECTURE

The CPCX HM&E architecture was developed using Advanced Surface Ship Evaluation Tool (ASSET). ASSET can be used to construct a model of a entirely new ship, or a modification of an existing ship. ASSET uses historical data and empirical formulas to model the ship's geometry, its powerplant, weight, performance, cost, manning, etc. It is used as a preliminary design tool to determine whether or not a proposed design is feasible. ASSET is a powerful tool, but has it's limitations. The biggest limitation appears to be that it can not model what has never been tried before, either for a new hull design or a non-traditional use of a existing system.

### *1. Ship's Power Generation and Distribution System*

A variety of engineering configurations were evaluated using ASSET. The combination of endurance and displacement requirements demanded a low volume, low weight, high efficiency power plant. The CODAG/Integrated Electric Propulsion offered the lightest vessel that met our requirements for speed, endurance and payload. The Additional benefits of the electric drive ship are numerous, including:

- More flexible power generation arrangements
- More freedom in plant arrangements
- Propulsion arrangement is not limited by shaft alignment
- Propulsion prime movers and generators can be smaller and more numerous
- Power can be generated in the most convent and/or efficient wave form
- More adaptable to future growth:
  - Directed energy weapons
  - ETC Gun Technology
  - Design conversion to fuel cells
- Better fuel economy

- Capability of operation at the most economic engine combination at any given speed
- Active Ship silencing capability
- Allows the power to the main engines to be adjusted to counteract cyclic load imbalances in order to reduce propulsion generated vibration

## HULL, MECHANICAL AND ELECTRICAL (HM&E) ARCHITECTURE

1. Ship's Power Generation and Distribution System CPCX uses an integrated Combined Diesel and Gas Turbine (CODAG) Power Off Main Bus (POMB) propulsion/ships service power plant. The power plant architecture consists of the following functional areas: power generation, power distribution, power conversion and conditioning, power storage, system loads, system control and information.

(a) Power Generation

There are four power generation sets,: two LM-1600 ICR gas turbines, each driving a 15 MW generator, and two Alco 12V270 diesels, each driving a 3000 KW generator. The power output is multiphase AC that is immediately rectified to DC for distribution on the DC Zonal Electric Distribution System (DC ZED).

(b) DC Zonal Electric Distribution System.

The power distribution system consists of port and starboard main busses feeding distribution zones as shown in Figure 3. The main lines aft of No. 1 ER are sized to provide full propulsion power on via either main bus. Portions of the main bus that are not expected to carry propulsion loads are sized to carry a full combat load.

(c) CS power supplies

The use of the DC ZED system allows multiple source paths without complex paralleling and switching systems. The power supply to the CS takes advantage of this ability by providing disbursed supplies from each of the main generators and

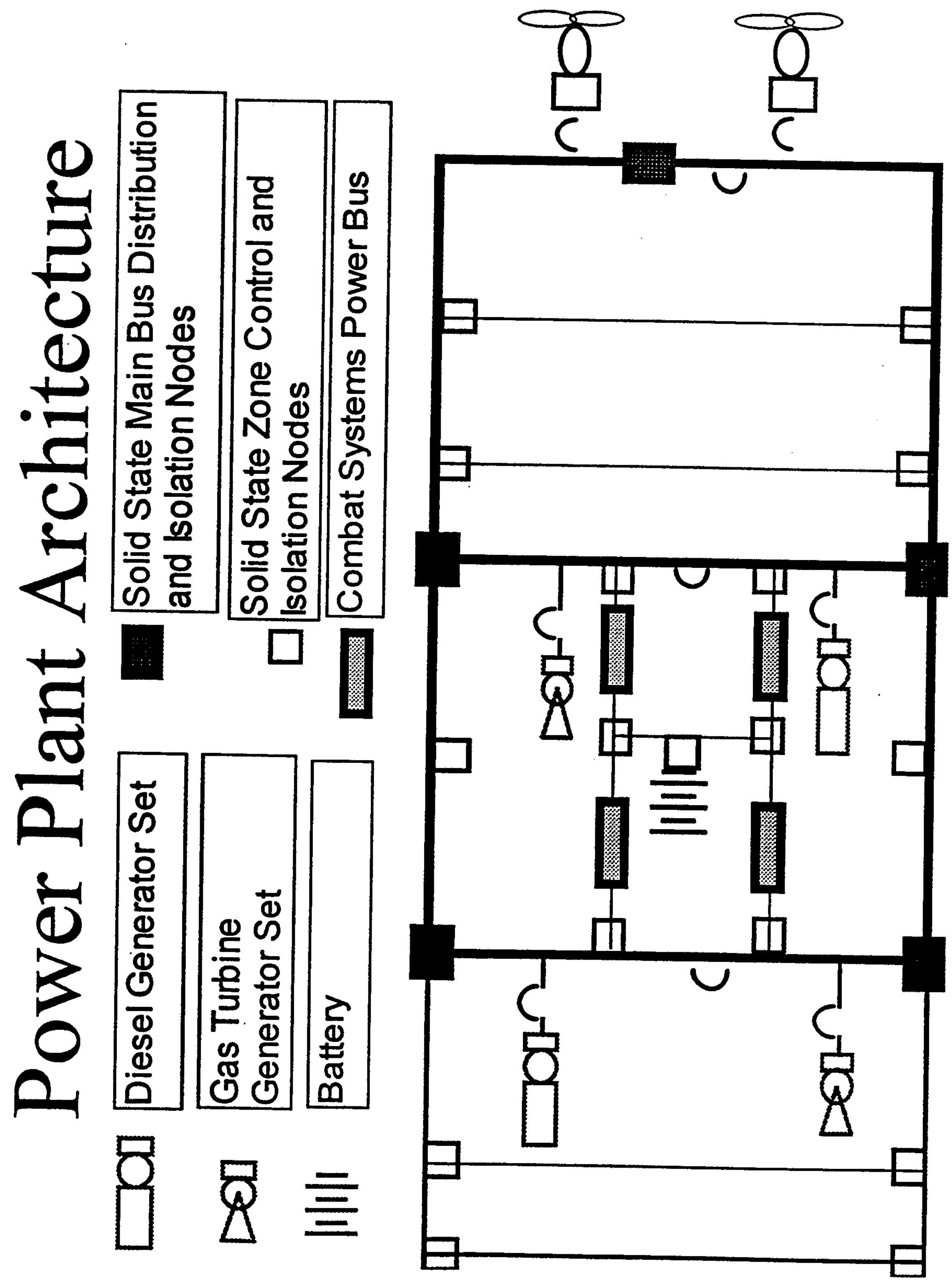



Figure 3 Electrical Distribution System

directly from the battery as shown in Figure 3. The four Combat System power buses (CSPB) are electrically the closest to the generators and the battery, Isolation and switching nodes can protect the CSPB's from abnormalities on the rest of the distribution system. The solid state controllers and isolation and switching nodes can present the combat system with an "infinite" bus as long as there is sufficient power available.

(d) Battery backup

To maximize survivability and system flexibility, a 30 ton battery was installed to provide emergency power in the event that all main generators go off line. The primary advantage of this, is that the battery is static and thus not as susceptible to shock as the generators. It will provide bus inertia and stability during shock events and continuing power when the generators trip off line on impact. A secondary but no less desirable benefit of the battery is the ability to cruise using the most efficient power plant alignment. Figure 4 shows the power generation requirements vs. speed for CPCX. It is important to note that most speeds can be attained using one gas turbine or two diesels engines operating at a moderate to heavy loaded. The battery allows operating turbines at their most efficient loading without compromising combat readiness of the ship during cruising and patrol/loitering operations. The ability to provide uninterrupted power during casualty loss of generators is also beneficial during Restricted Maneuvering conditions wherein the ship would still be able to maintain bare steerage propulsion and rudder control. The battery would also help reduce the run time on the ships engines, since only those engines required to provide power need be running. Standby engines can be started when necessary and can be allowed to pre-lube and soft start rather than emergency start at the lose of the on-line units (tactical situation permitting)

(e) Control and Monitoring

The power distribution system is overlaid with fiber optic control and monitoring network. This network connects the solid state controllers of the ships equipment to the control stations and monitoring computers. The solid state controllers effectively isolate the individual loads from the main bus and allow more accurate

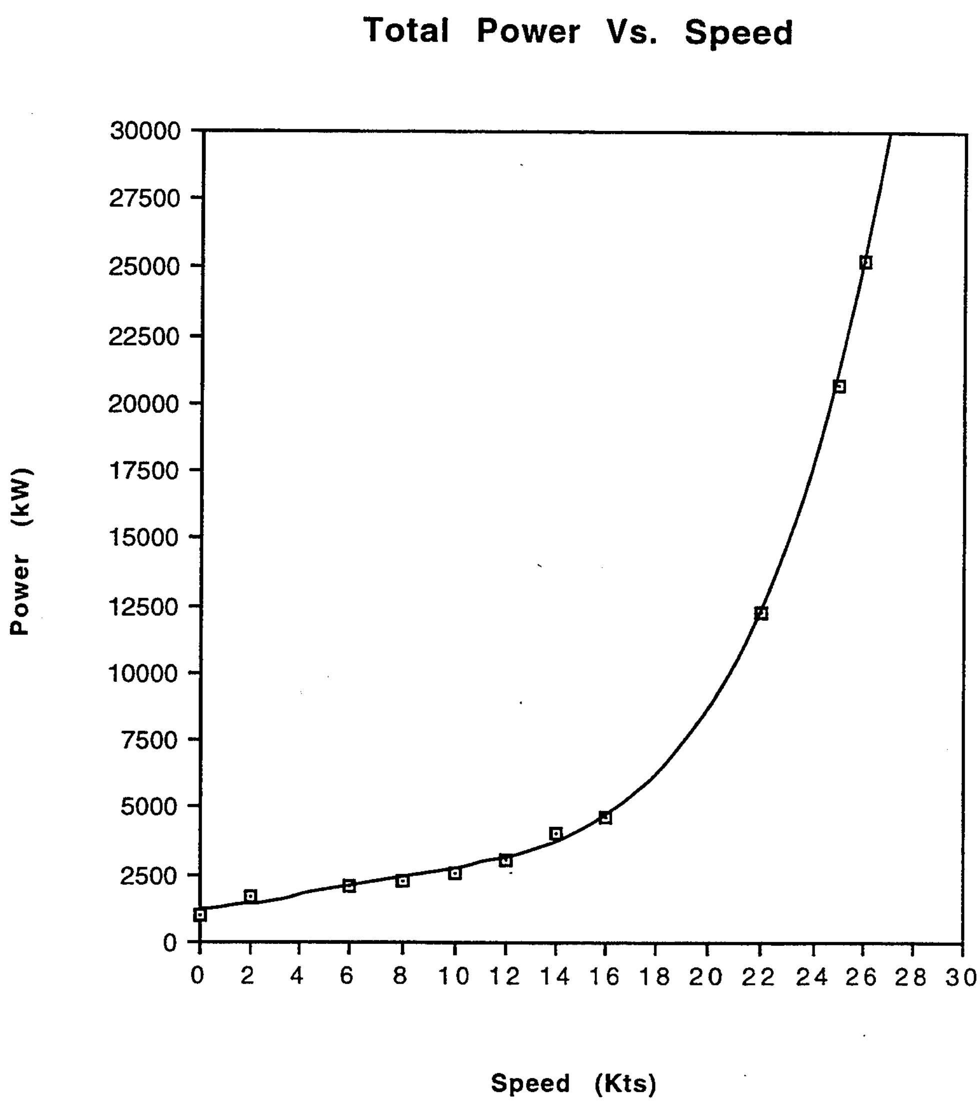



Figure 4 Power Curves

monitoring of cyclic load fluctuations of the individual loads. Central monitoring and control of the ships equipment allows more accurate failure analysis, faster fault detection and isolation, and smarter, more effective load shedding and load restoration. Automatic central control and monitoring greatly enhances the ability to implement condition based maintenance and significantly improves trend analysis and reduces the need for paper equipment logs.

## 2. *Hull, Mechanical and Electrical Arrangements*

### *(a) Machinery Spaces*

The CPCX incorporates two main machinery spaces, Engine Room 1 (ER1) and Engine Room 2 (ER2). Each engine contains two power generation sets (gensets), one gas turbine and one diesel. The gas turbine gensets consist of General Electric LM1600 RGT, producing 15,902 Bhp, which is connected to a 14.94 MW AC generator. The diesel gensets consist of a Alco 12V270 producing 4000 Bhp, driving a 3,000 kW AC Generator. The AC power produced by the generators is rectified to DC for propulsion power and ship's service distribution throughout the ship. Both engine rooms are completely independent of each other with respect to support equipment.

Below is a listing of the major machinery components found in the engine rooms.

| EQUIPMENT | NUMBER INSTALLED (per Engine Room) |
|---|---|
| Gas turbine genset module | 1 |
| Diesel genset | 1 |
| Lube oil service and purification system | 1 |
| Fuel oil service and purification system | 1 |
| High pressure air compressor | 1 |
| Low pressure air compressor (ship's service) | 1 |
| Power Conversion Modules | As required |

| | |
|---|---|
| Power Distribution Modules | As required |
| Machinery Control Equipment (local) | As required |
| Jacket water system (Diesel cooling) | 1 |
| Salt water cooling system (Diesel and generators) | 1 |
| Fire Suppression and Extinguishing System | 1 |
| Bilge Eductor | 1 |
| Machinery Room Ventilation System | 1 |
| Anti-roll fin system (in ER2 only) | 1 |
| Auxiliary Boilers (electric powered) | 1 |

*(b) Auxiliary Machinery Spaces*

The CPCX incorporates 3 Auxiliary Machinery Spaces (AMS1,2 & 3), all on the fourth deck. AMS1 is located just aft of the VLS compartment, and includes access to the mine detection sonar trunk. Major equipments found in AMS1 include a vacuum type sewage collection, holding and transfer system that serves the forward end of the ship. A fire pump, air conditioning plant, fuel oil distribution manifold.

AMS2 is located between ER1 and ER2 and contains the reverse osmosis/potable water system, fire pump and air conditioning plant for the middle of the ship.

AMS3 is located aft of ER2. Its major equipment is the oily water separation system, and the third fire pump.

*(c) Miscellaneous Engineering Spaces*

The Miscellaneous Engineering Spaces include the Pod Machinery Room, After-Steering, stern launch area and the assorted shops (Machine, Electrical, Filter, and Damage Control).

The Pod Support Room will contain the Power Conditioning Modules (PCMs) for the motors in the pods. After steering will contain the steering gear and associated

equipment, while the stern launch area will contain ATAS or boats and NIXIE equipment, as well as handling equipment.

It is in the stern launch area where the most noticeable HM&E difference between the Navy and Coast Guard version exists. For the Coast Guard variant, this is the location of the Aft Boat Launch and Retrieval System. It consists of a pivoting, semi-buoyant, V-shaped ramp, which is lowered (drawbridge style) into the wake to allow for Rigid Hull Inflatable launch and recovery. The ramp is a steel framework, with rubber rollers along the sides of the V, much like a recreational boat trailer. The Navy variant will also have a similar system for launching and handling ATAS.

*(d) Fuel Capacities*

All diesel fuel tankage is distributed on the 3rd and 4th (inner bottom) decks of the CPCX Navy version. The Coast Guard version retains all of the Navy tanks and adds 7 more at the bottom of the VLS well and below it. The total diesel fuel tankage for the Navy Version is 143,976 gal. (466.6 ltons) and 183,160 gal. (593.6 ltons) for the Coast Guard version. The additional weight of the Coast Guard tankage, is offset by the removal of the VLS and the 5" gun and its ammunition. Both versions also carry 23,578 gal. (71.3 ltons) of JP-5 aviation fuel. The JP-5 tank is also located in the inner bottom, forward of ER2. The tank characteristic tables and graphs are shown in Appendix (M).

*(e) Firemain System*

The Firemain system for the CPCX is a hybrid of the traditional Navy (wet) and Coast Guard (dry) systems. It consists of 3 pumps (one in each Auxiliary Machinery Space), on a ring, that is segregatable into 3 independent loops. The firemain system will be used only for fire-fighting capability, vice as a fire and flushing/cooling system. Auxiliary cooling water for major systems will be provided via Auxiliary Saltwater (ASW) cooling pumps. This feature is intended to reduce maintenance on cooling systems, by providing cooling water at much lower pressures (30-60 psi vice 115-150 psi).

The key feature of the firemain system, are the hydro-pneumatic accumulator (HPA) tanks (3 each). The accumulator tanks will pressurize the entire main, each capable of provide 1 minute of firefighting water to two 95 gpm nozzles. This is sufficient time for the firepump(s) to start up and supply the system. The normal operating mode for the firepumps will be in a standby (off) status. The pumps will be activated via pressure switches on the accumulator tanks. A simple line diagram of the system is shown in Figure 4.

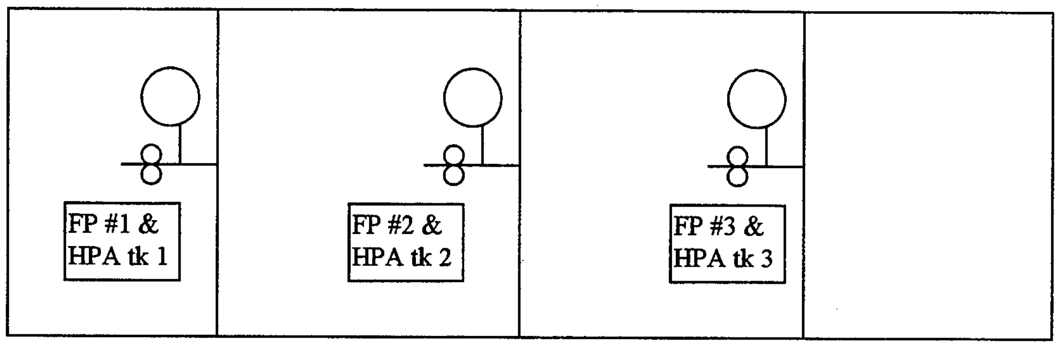



Figure 5 Firemain Line Diagram

The HPA tanks are charged off the ship's service low pressure air system. This system is designed to reduce the overall maintenance requirements for the pumps. While it can be expected that maintenance will increase on the starting circuits, the reduced maintenance on the pumps, and piping systems will more than offset the slight increase in electrical maintenance.

*(f) Miscellaneous Engineering Features*

Several key features of the CPCX in addition to those discussed above, include: Collective Protection System (CPS), federated compartments, vacuum sewage system, reverse osmosis distillation plant, combat system holdup battery, and automated machinery control system.

## C. ARRANGEMENTS

### 1. Navy Variant

The detailed arrangement drawings for the Navy variant are included in Insert Pages (1) through (6). The drawings start on the 02 level and work down through the ship.

- Insert (1) : 02 Level -- Equipment placed here includes the 40mm multipurpose guns, Signal Shack, SRBOC locker, SPG-62 Equipment room, and mounts for various antennas.
- Insert (2) : 01 Level -- Major spaces include the Bridge, CO's Cabin, Chart Room, RAM Launcher and various equipment rooms. The location of the CO's cabin provides immediate access to the Bridge.
- Insert (3) : 1st Deck (Main) -- Key features include the 5" Gun, VLS Missile Modules (on Foc'sle), Officer Staterooms, Operations Office, Wardroom, Ship's Office, Helicopter Hangar, Aviation Repair Shop, Boat Rooms, Torpedo Rooms and Flight Deck. The Flight Deck is sized to launch/recover all current US/NATO inventory rotary wing aircraft with the exception of the CH-53. The Helicopter Hangar is composed of two major components, a fixed portion and telescoping portion, which will enable the stowage of the selected airframe, the AS-565 Panther.
- Insert (4) : 2nd Deck -- The 2nd Deck is characterized by two main outboard passageways, port and starboard, which run nearly the length of the ship. In addition to simplifying access, these passageways provide a protective buffer zone for small arms fire and shrapnel from close aboard misses. Major spaces forward include the Bos'n Locker, Forward Windlass Room, 5" Gun Control Room (immediately below gun), VLS compartment, Weapons Control Room for VLS, Repair Locker #2, Supply and Log Offices, and the Casualty Control Station (CCS), which is located between the two engine rooms. Immediately forward of amidships lies the Mess Deck, CPO Mess, Galley, Scullery, and Recycling (Trash) spaces. The AFFF station for the foward Engineroom is outboard of the Recycling Space. Aft of amidships is the secondary Combat Information Center, CIC #2. Repair Locker 5 (Machinery Repair) is situated between the two engine

rooms. The aft portion of the second deck contains CPO and crew berthing, Sick Bay, Fitness Room, Collective Protection System (CPS) airlocks and various storerooms. Furthest aft lies After Steering, which contains ATAS, NIXIE, and the steering gear.

- Insert (5) : 3rd Deck -- The forward portion of the 3rd Deck contains mostly unmanned spaces (Chain Locker, Upper 5" Magazine, VLS, and a storeroom). Amidships lies the majority of the respective technician shops and storerooms (machine, filters, electrical, tool room), the combat system holdup batteries (UPS) and laundry. The after end of the 3rd deck contains fuel tanks, storerooms, and the Pod Machinery Room.
- Insert (6) : 4th Deck -- The 4th Deck is the information and propulsion center of the CPCX. It houses the main warfighting, communication, and mobility stations onboard. The forward 3 compartments of the 4th deck contains the same spaces as the 3rd Deck (Chain Locker, Lower 5" Magazine, and VLS). Aft of the VLS is the SH-100 Mine Sonar Trunk, and Auxiliary Machinery Space #1. The primary Combat Information Center, CIC #1 is located just forward of Engine Room #1. This location provides two watertight bulkheads and one deck seperation between primary and secondary CICs. The space between the enginerooms is occuppied by Auxiliary Machinery Space #2, Refrigerated and Dry Stores, and Radio. Aft of Engineroom #2 is Auxiliary Machinery Space #3. Below the 4th deck are the majority of the CPCX fuel tanks, JP-5 and potable water tanks.

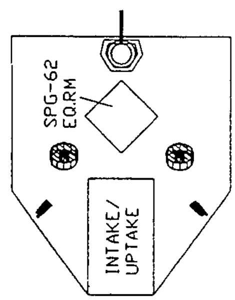
### 2. Coast Guard Variant

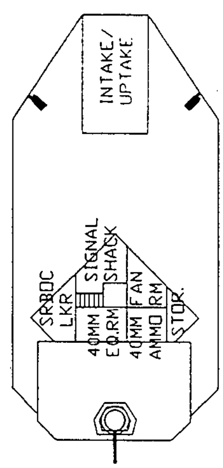
The detailed arrangement drawings for the Coast Guard variant are included in Insert Pages (7) through (12). The drawings start on the 02 level and work down through the ship. The only differences between Navy and Coast Guard layouts will be discussed below.

- Insert (7) : 02 Level -- Similar.
- Insert (8) : 01 Level -- Similar
- Insert (9) : 1st (Main) Deck -- On the foc'sle, the 5" Gun and VLS have been replaced by a hydraulic crane and storage well, respectively. The Torpedo Rooms have been converted into Prisoner Containment Rooms as well.

- Insert (10) : 2nd Deck -- The gun hydraulics in the space known as the Gun Control Room on the Navy version will remain to power the crane. The remainder of the space will be used for storage of an environmental containment skirt. The space once occuppied by the VLS is now dedicated to large item storage, such as bouys. The ATAS/NIXIE Room aft has been converted into a Rigid Hull Inflatable (RHI) Launch and Recovery Room, with an integral ramp through the transom.
- Insert (11) : 3rd Deck -- The Upper 5" Magazine has been converted into a storage room for an environmental containment skirt. Removable fuel tanks have been installed in the VLS space.
- Insert (12) : 4th Deck -- The Lower 5" Magazine has been converted into a storage room for an environmental containment skirt. Removable fuel tanks have been installed in the VLS space.

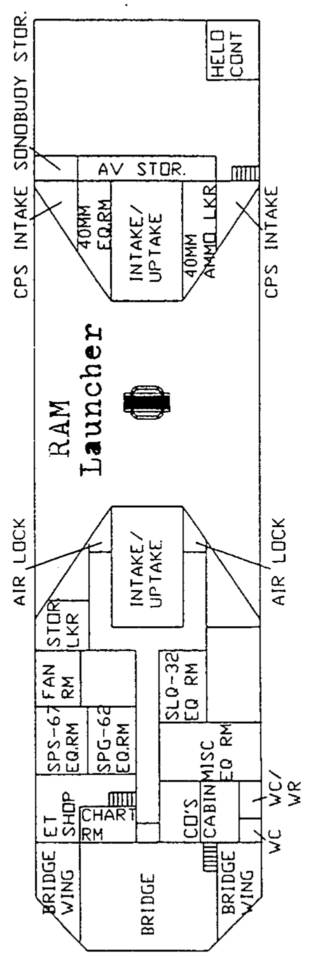
# 02 LEVEL



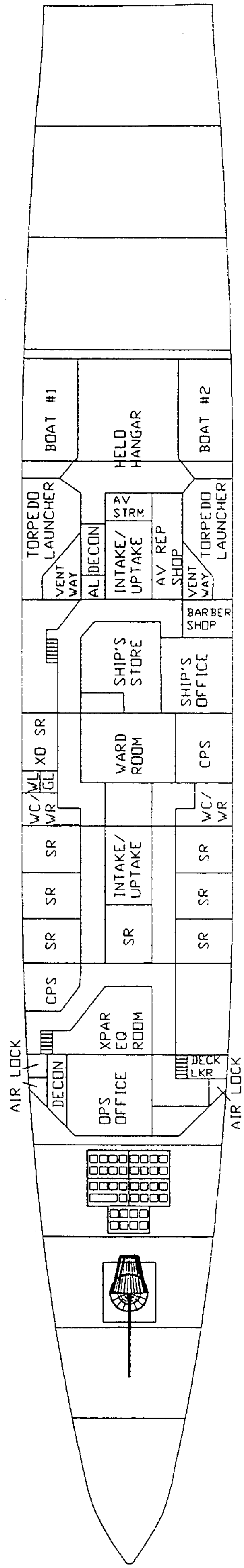

Insert 1
Navy Layout

# 01 LEVEL

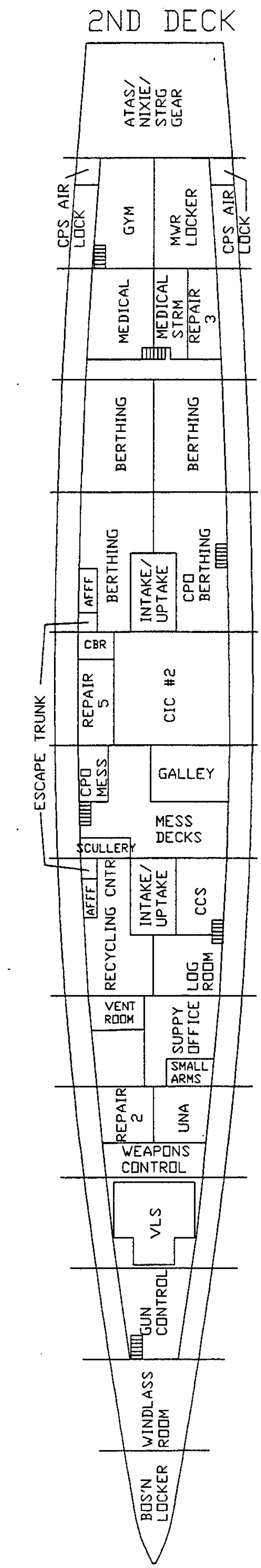



Insert 2
Navy Layout

# 1ST DECK

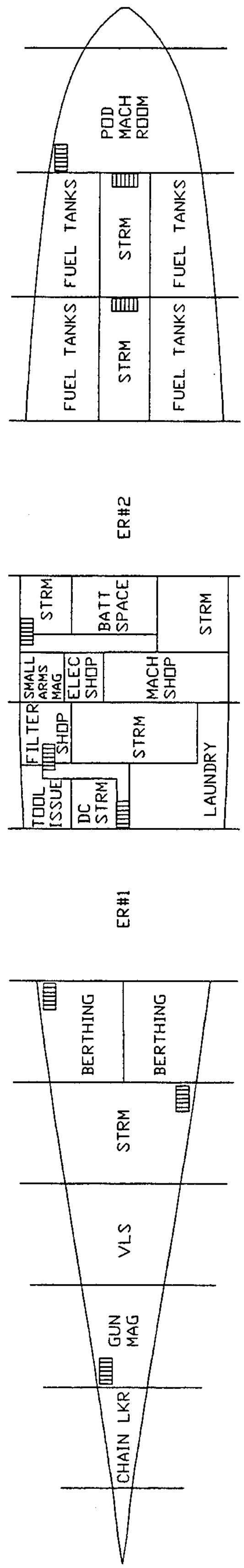



Insert 3
Navy Layout



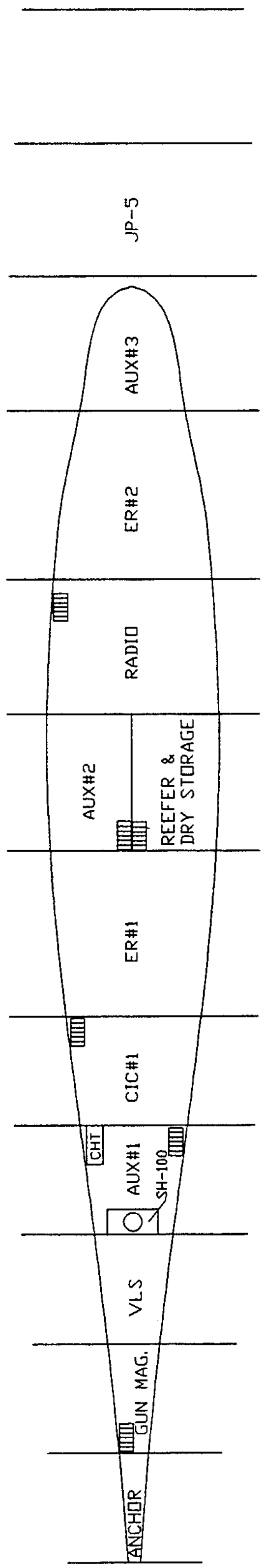

Insert 4
Navy Layout

# 3RD DECK



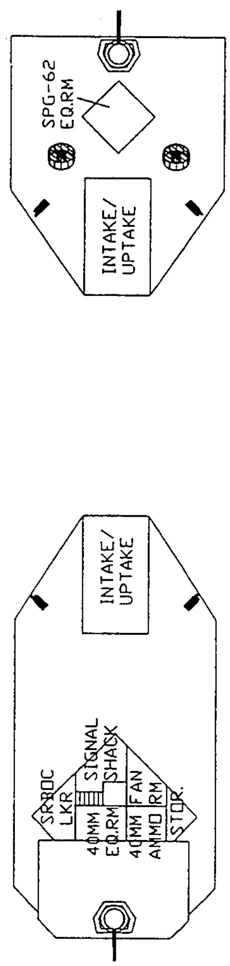

Insert 5
Navy Layout

# 4TH DECK



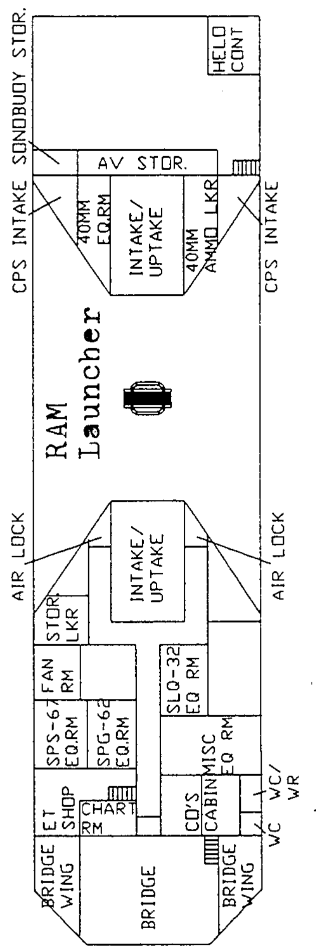

Insert 6
Navy Layout

# 02 LEVEL



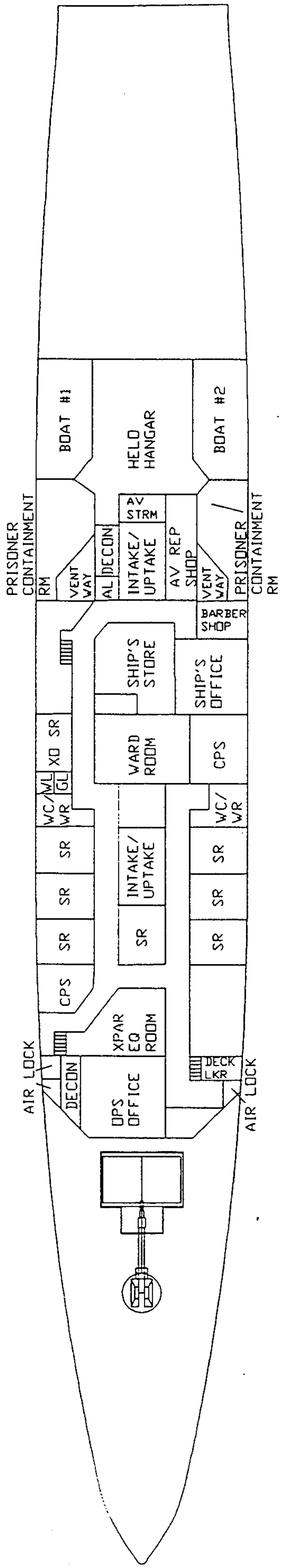

Insert 7
Coast Guard Layout

# 01 LEVEL

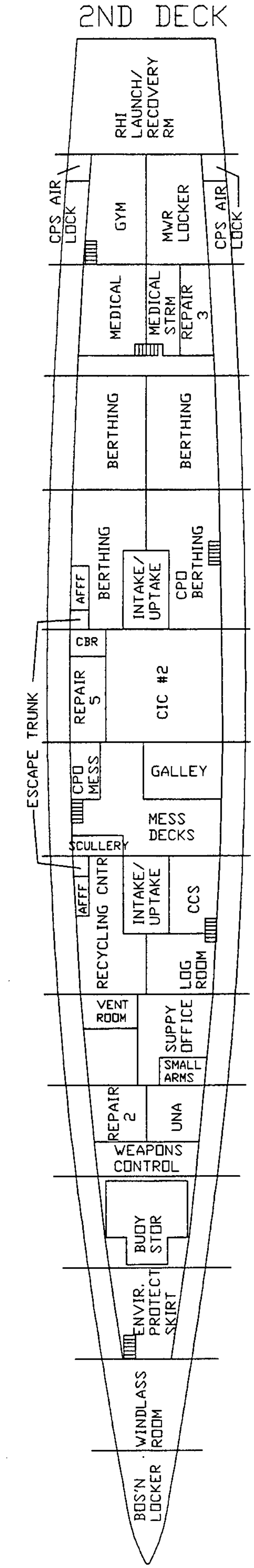



Insert 8
Coast Guard Layout

# 1ST DECK

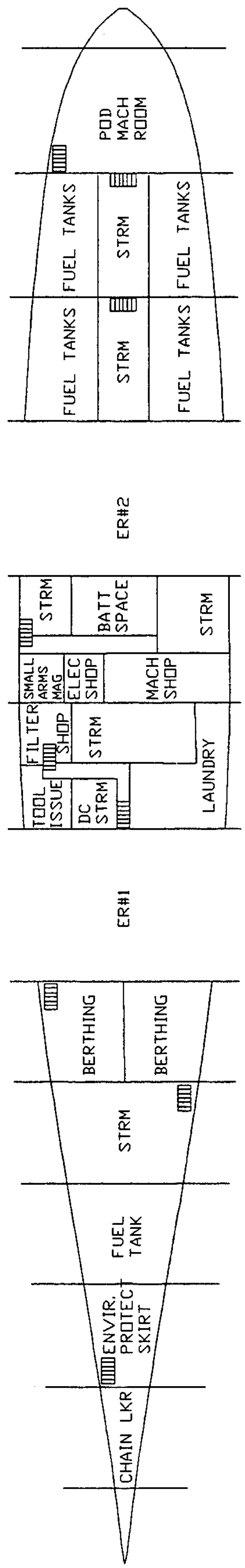



Insert 9
Coast Guard Layout



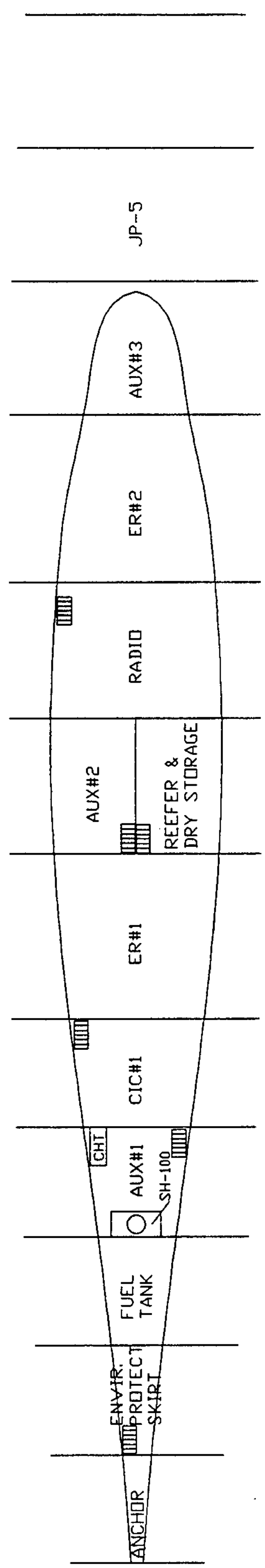

Insert 10
Coast Guard Layout

# 3RD DECK




Insert 11
Coast Guard Layout

# 4TH DECK




Insert 12
Coast Guard Layout

## D. NAVAL ARCHITECTURE

The initial naval architecture calculations were done using ASSET, and the results are provided in Appendix (N) (ASSET printed reports) and Appendix (O) (ASSET Drawings). The offsets from the hull form were imported into "General Hydrostatics" (GHS), and analyzed. The naval architecture figures and calculations provided include: lines drawing, curves of form, cross curves of stability, floodable length, static stability, weight distribution, and bending moments. The computer models run through GHS were based on a full load displacement of approximately 4000 tons. This is a slight difference from the ASSET predictions of 3980 tons displacement. This displacement difference can be attributed to several factors: Appendages (pods, propellers, rudders, fins, bilge keels, skeg) were not modeled on GHS, but their respective weights were (due to complexity and time-constraints). Actual tankage vs. required tankages were also different. For example, ASSET did not include any lube oil storage capacity while the GHS model accounts for 9.62 ltons. The actual modeling of the tankage has several inherent inaccuracies as well. The tank size, location and permeability inputs for GHS were all estimated. Further iterations of the design would refine the geometry, most likely resulting in smaller tanks.

The most significant discrepancy with the hull geometry is the full load trim. It is at 3.5 ft forward. This is most likely due to the weight distribution (combat payload and fuel tankage) in the forward half of CPCX. Possible remedies include a redesign of the bow section to make it fuller, ballast aft, rearrangement of fuel tanks, and rearrangement of combat payload (VLS and main gun). The following charts and graphs were plotted from and computed by GHS and included in Appendix (P).

### *1. Body Plan and Isometric View*

The Body plan and Isometric view are shown in Figure 6.

### 2. *General Hydrostatics*

The General Hydrostatic curves are shown in Figure 7.

### 3. *Curves of Form*

The curves of form are shown in Figure 8.

### 4. *Cross Curves of Stability*

The Cross Curves of Stability are shown in Figure 9. It provides a display of the ship's righting arm for various angles of heel, over a range of displacements. The curves displayed need to be corrected for the assumed KG, which in the figure shown is 0.0 ft.

### 5. *Floodable Length*

The floodable length curve is used to determine the allowable compartment lengths which will ensure that the margin line is not submerged, should the compartments spanning the defined factor of subdivision become flooded. As described in Design Data Sheet (DDS) 079-1, *Stability and Buoyancy of Naval Surface Ships*, the factor of subdivision for combatants is 15% of LBP, with a margin line of three inches below the bulkhead deck (main deck). The factor of subdivision for the CPCX is 57 feet. The standard values of permeability given in Principles of Naval Architecture, Vol. I (p. 190) are:

| | |
|---|---|
| Cargo and Stores | 0.6 |
| Accommodations and voids | 0.95 |
| Machinery Spaces | 0.85 |

GHS was used to calculate Floodable Length based on hull form, and the results were used to verify the bulkhead placement generated by ASSET. A worst case and best case scenario were used for the permeability value for the CPCX hull form. Worst case assumed a permeability of 0.95 for the entire ship, best case assumed a permeability of 0.70. The results are shown in Figure 10. CPCX meets the worst case foldable length criteria, except at the stern. There is one three bulkhead group that is 57 feet apart and another that is 57.5 feet apart. This necessitates further analysis into the actual placement and expected permeability's, which is recommended for future iterations of the design.

### *6. Static Stability Curve at Design Load Condition*

The CPCX static stability curve is shown in Figure 11. The CPCX reaches a maximum righting arm of 5.140 ft at 46.1° of heel.

### *7. Hull Load Distribution Curve*

The hull load distribution curve is shown as part of the bending moment curves described below.

### *8. Bending Moment Curve (sagging)*

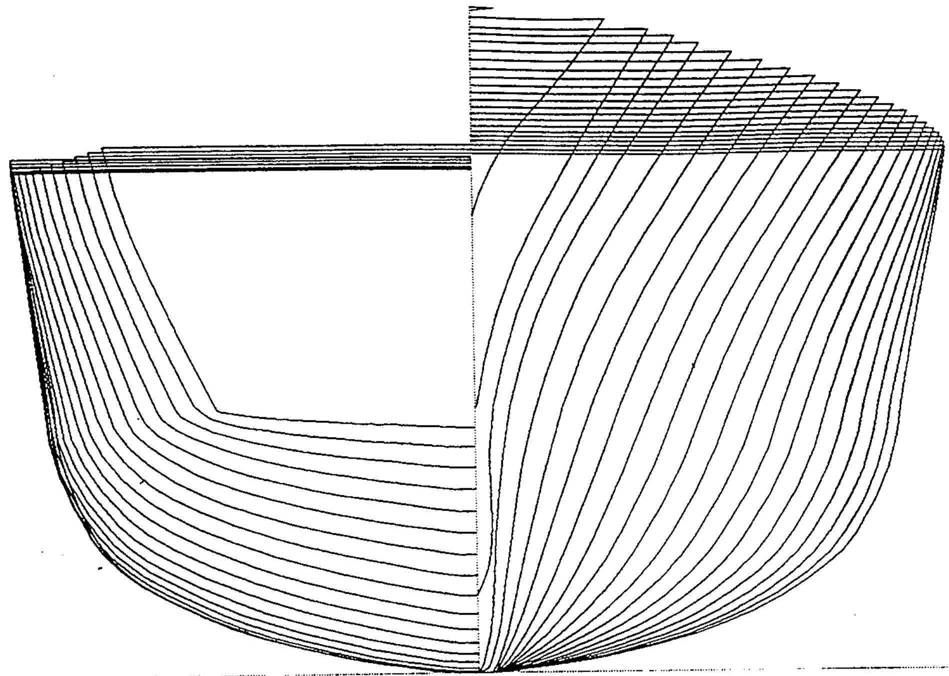
The Bending Moment curve (sagging) is shown in Figure 12. CPCX has a maximum bending (sagging) moment of 62,961 LT-ft at 191 ft aft of the forward perpendicular.

### *9. Bending Moment Curve (hogging)*

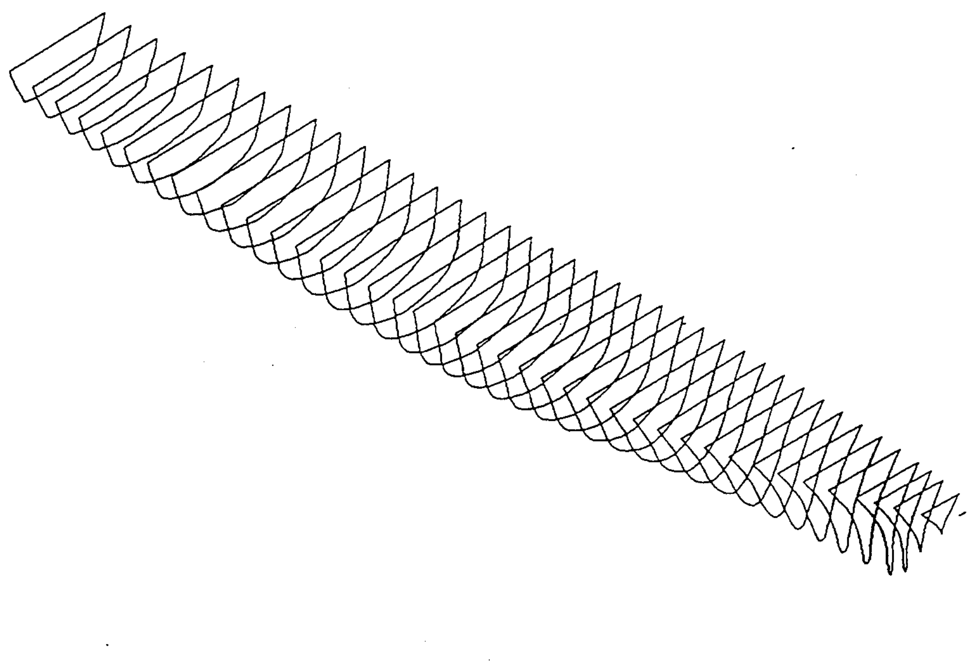
The Bending Moment curve (hogging) is shown in Figure 13. CPCX has a maximum bending (hogging) moment of 57,893 LT-ft at 195 ft aft of the forward perpendicular.

## 10. Midship Section Structural Design

The Midship Section Structural Design developed by ASSET is shown in Figure 14.




HULL Body Plan (1 component)
Scale = 1:95



HULL Isometric Projection

Figure 6 Body plan and Isometric View

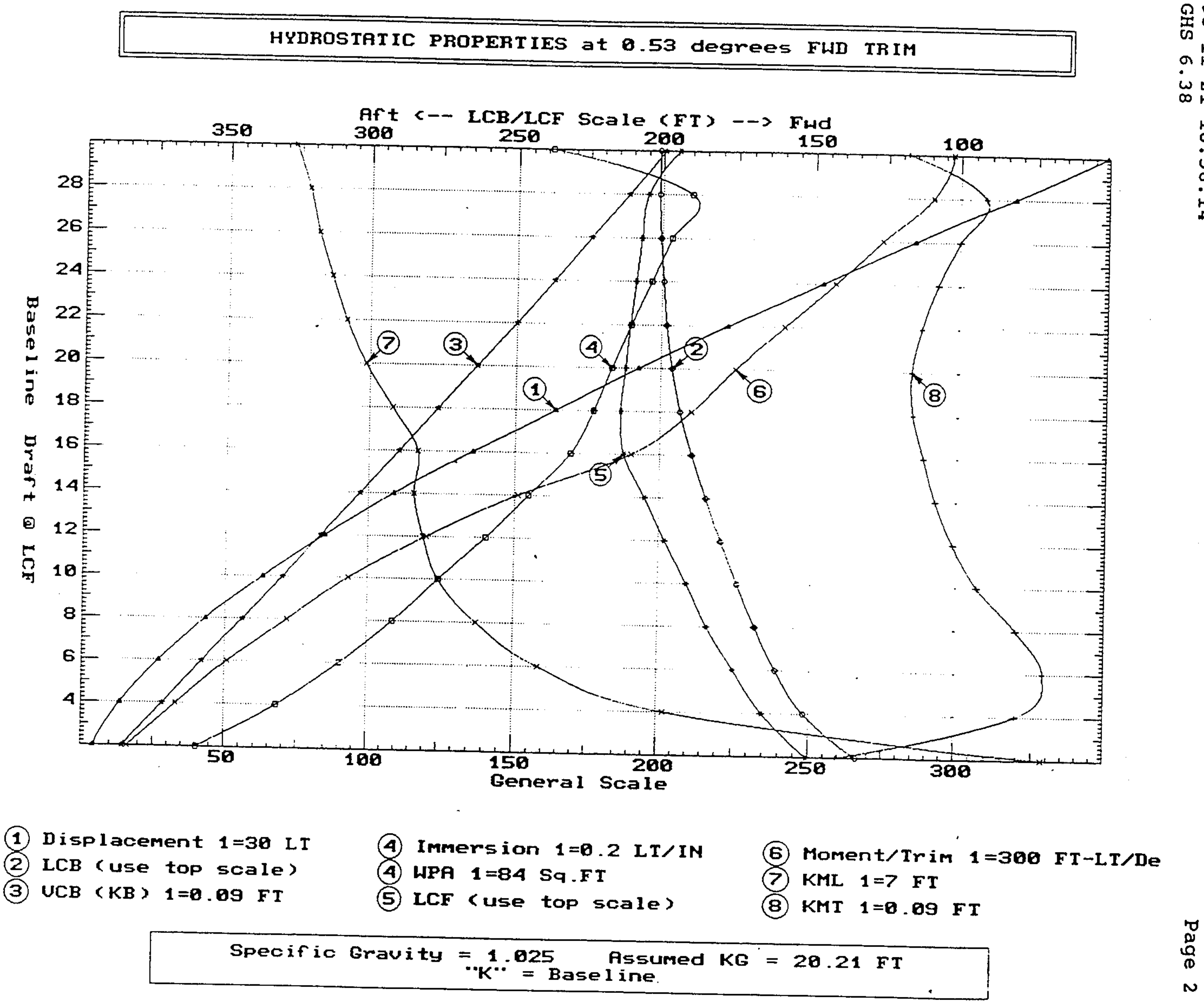



Figure 7 Hydrostatic Curves

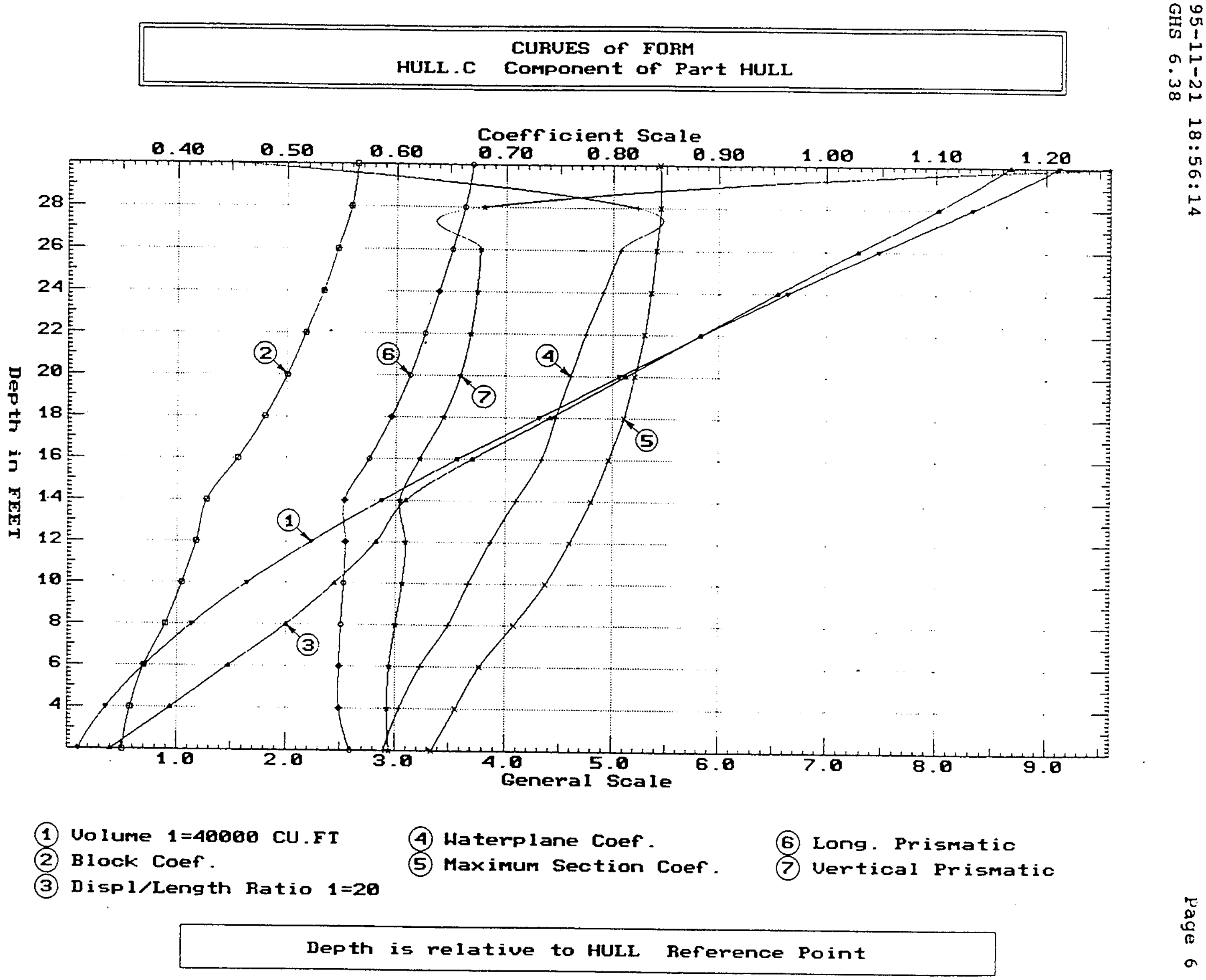



Figure 8 Curves of Form

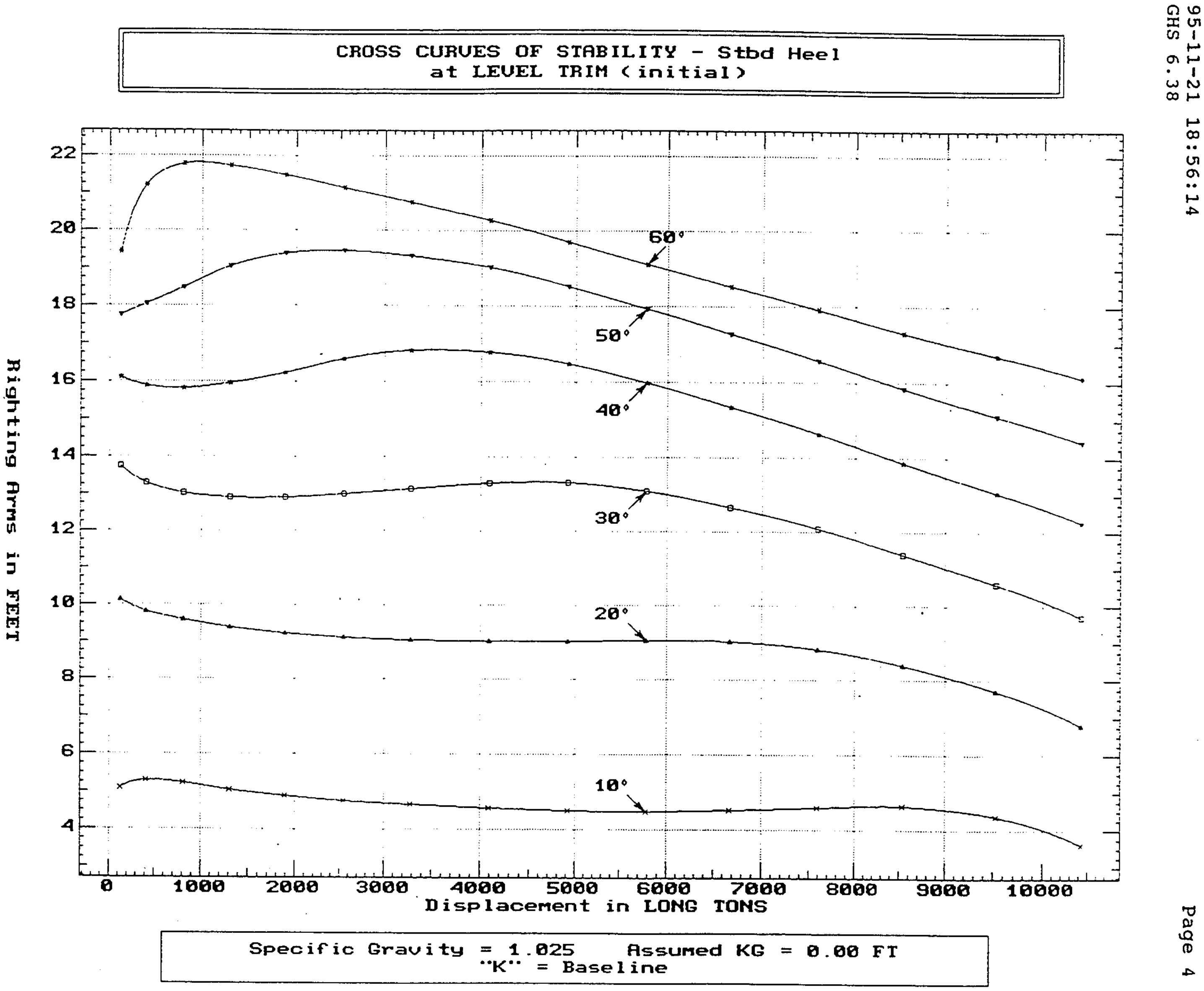



Figure 9 Cross Curves of Stability

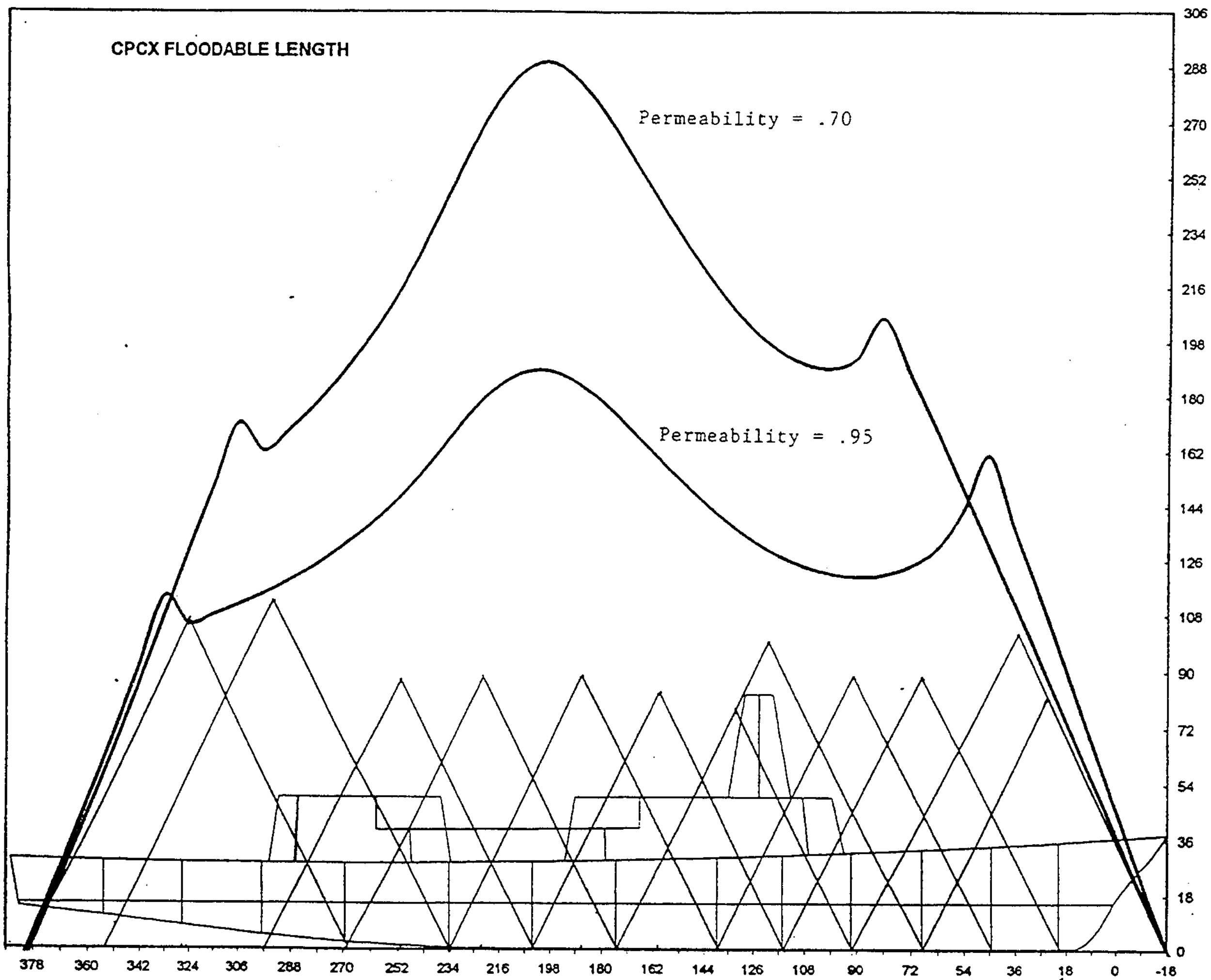



Figure 10 Floodable Length

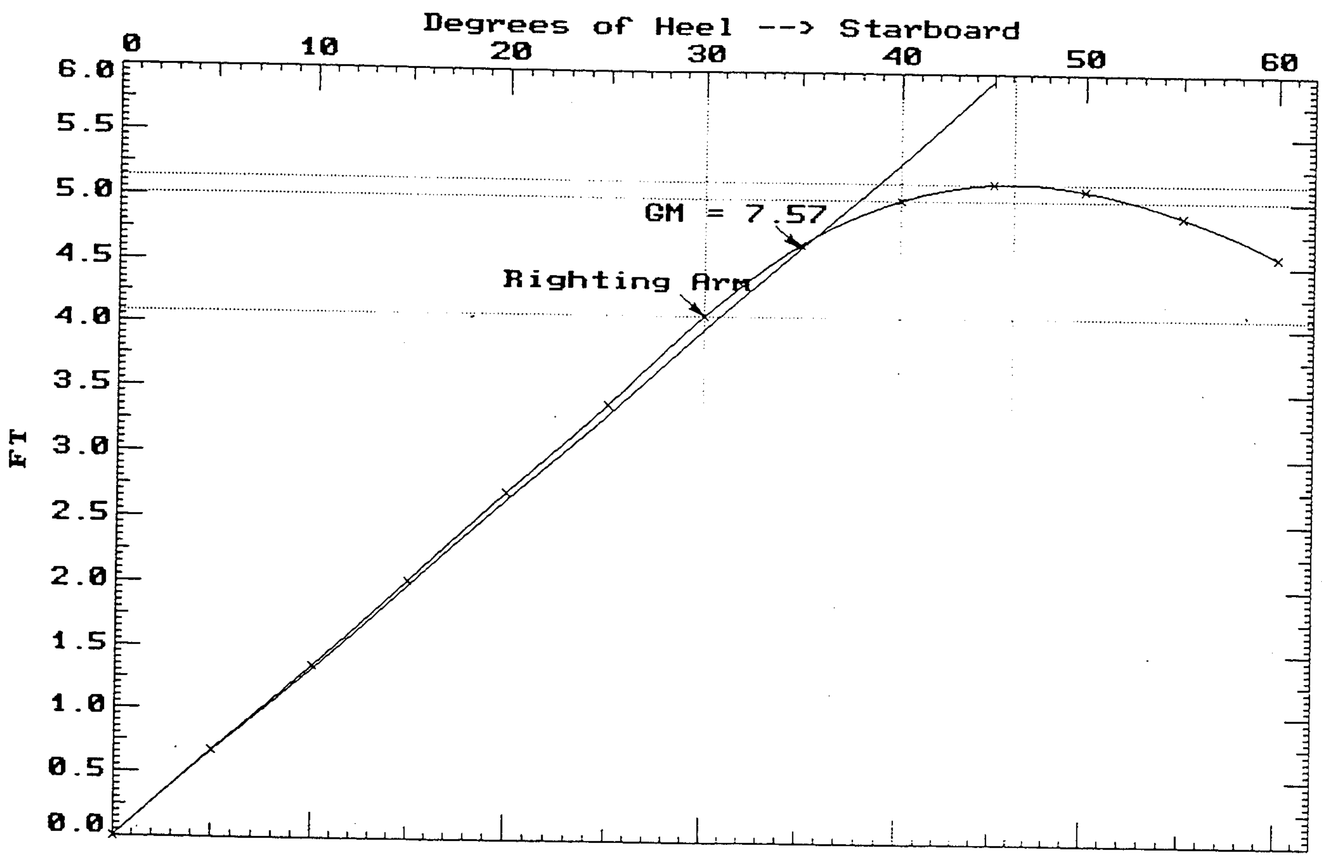



Figure 11 Static Stability Curve

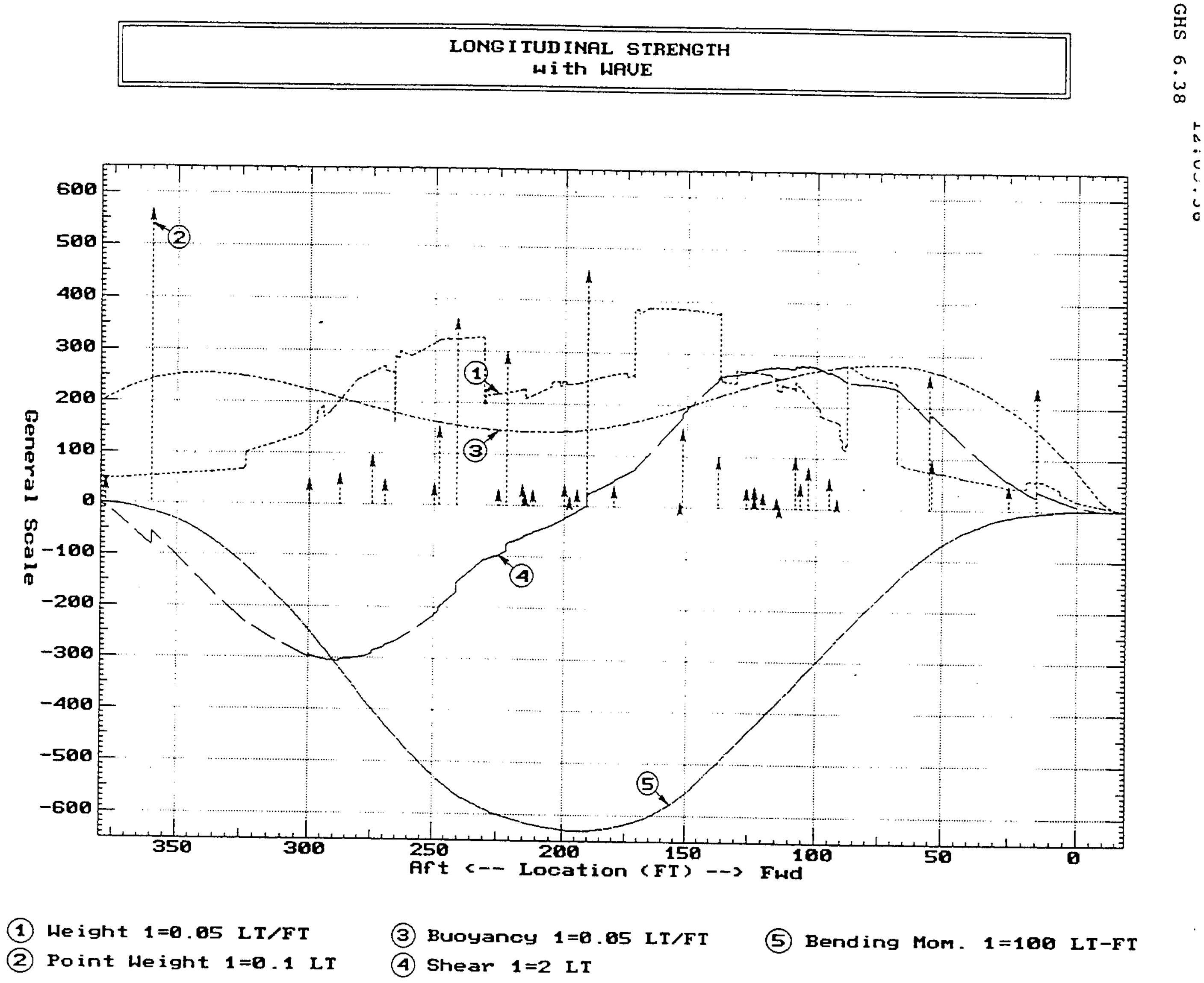



Figure 12 Bending Moment Curve (Sagging)

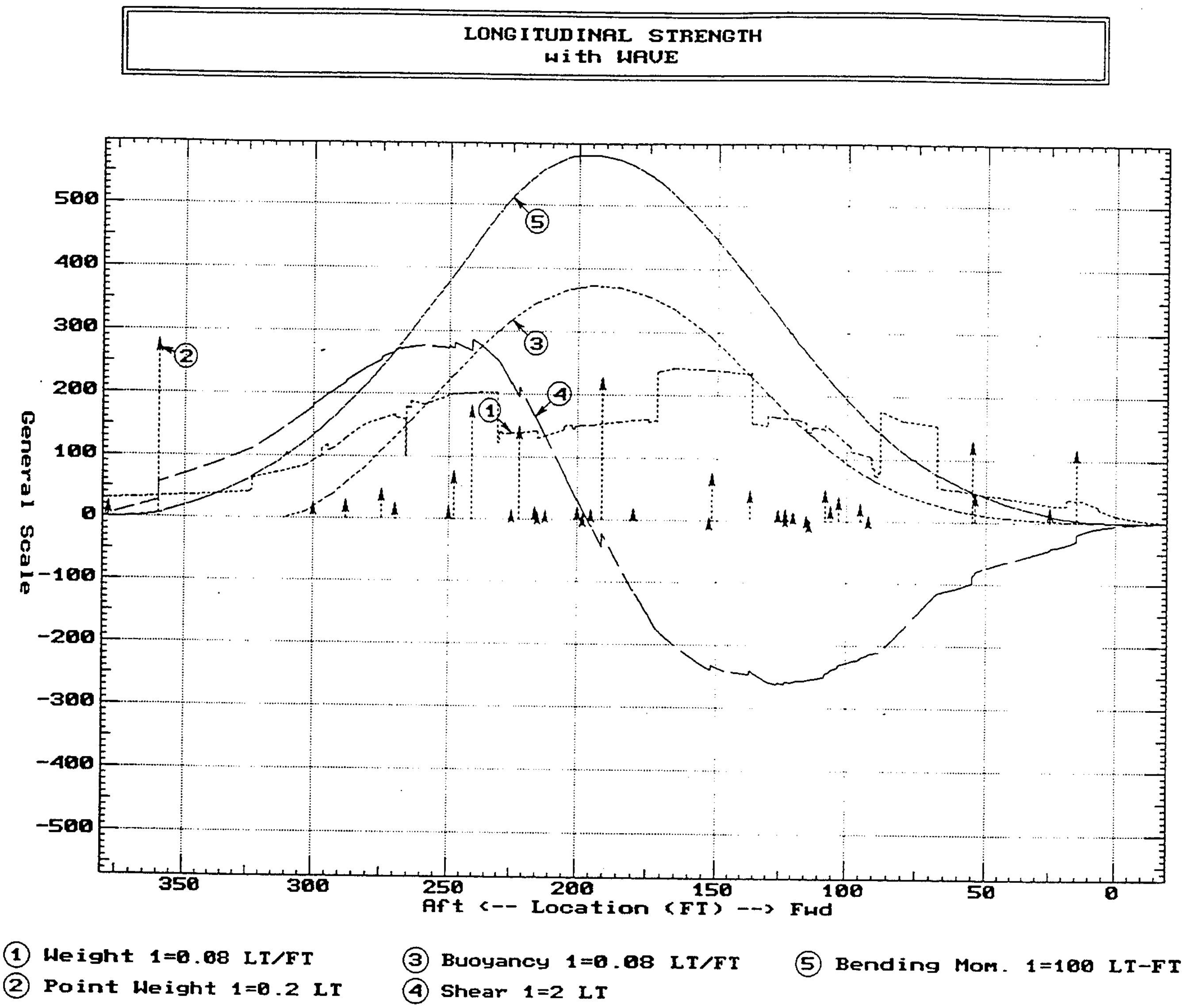



Figure 13 Bending Moment Curve (Hogging)

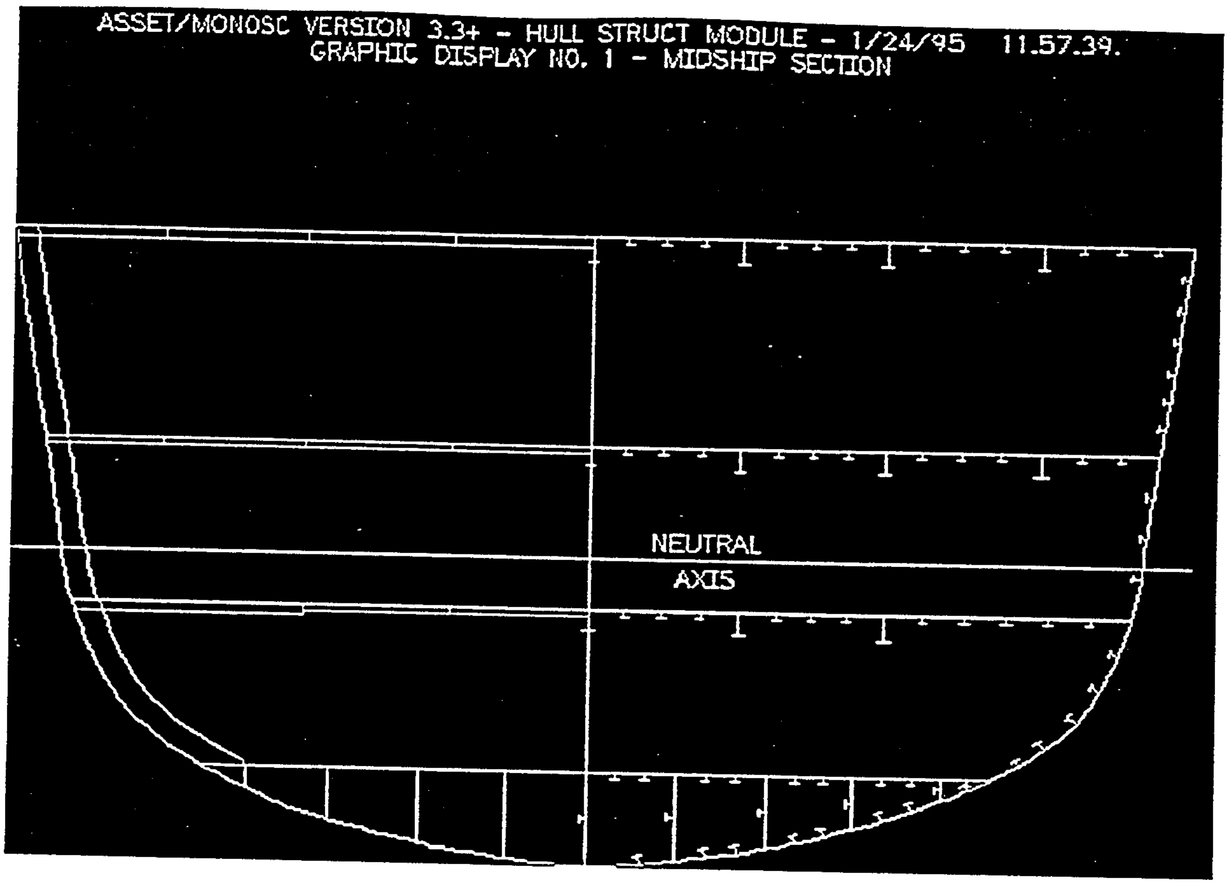



Figure 14 Midship Section

## E. DETAILED DRAWINGS

Detailed space arrangements are included for the following spaces as Insert pages (13 through (15).

Combat Information Center 1

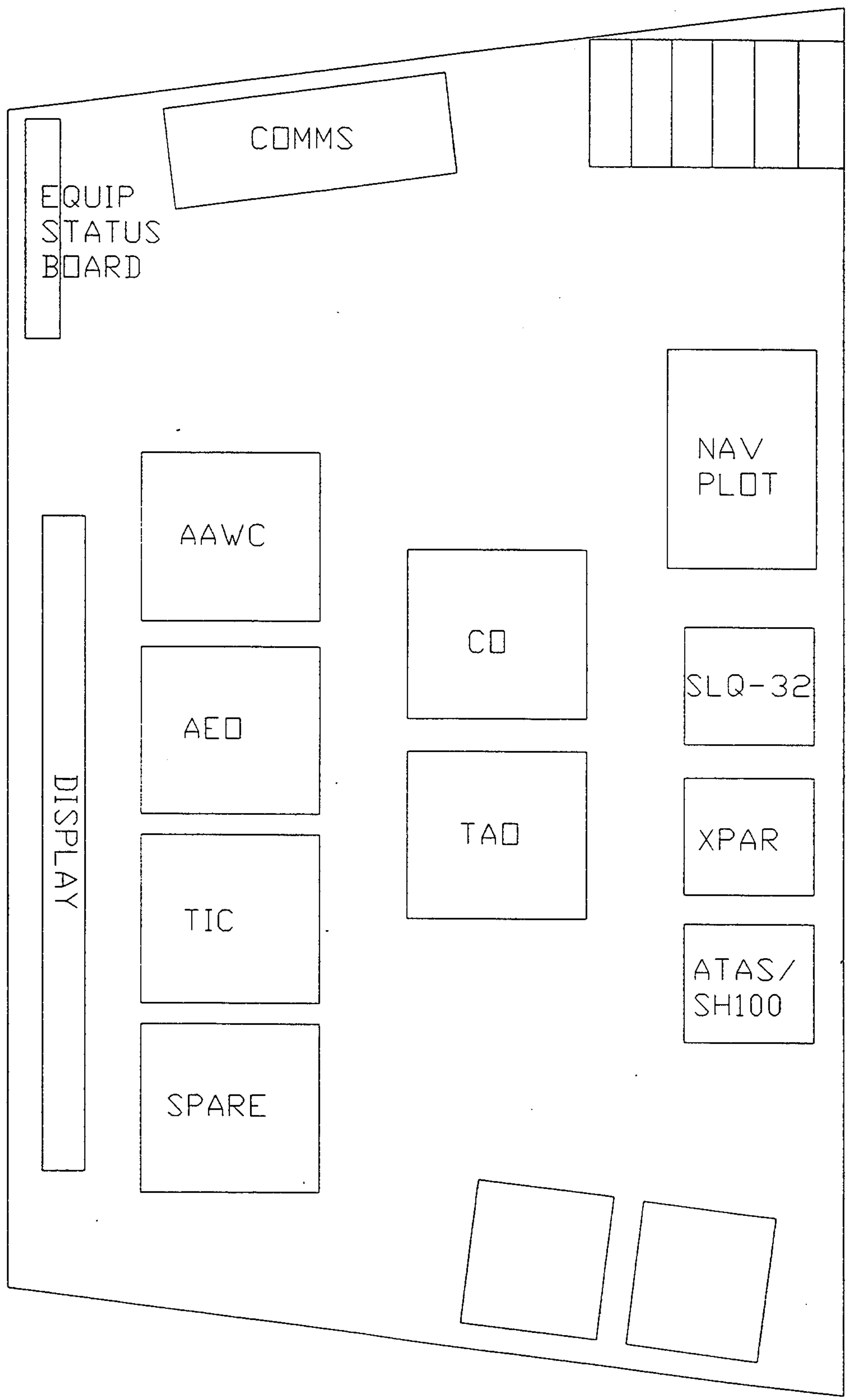
Combat Information Center 2

Pilothouse

Various topside views of the Navy variant are included as Insert pages (16) through (23).

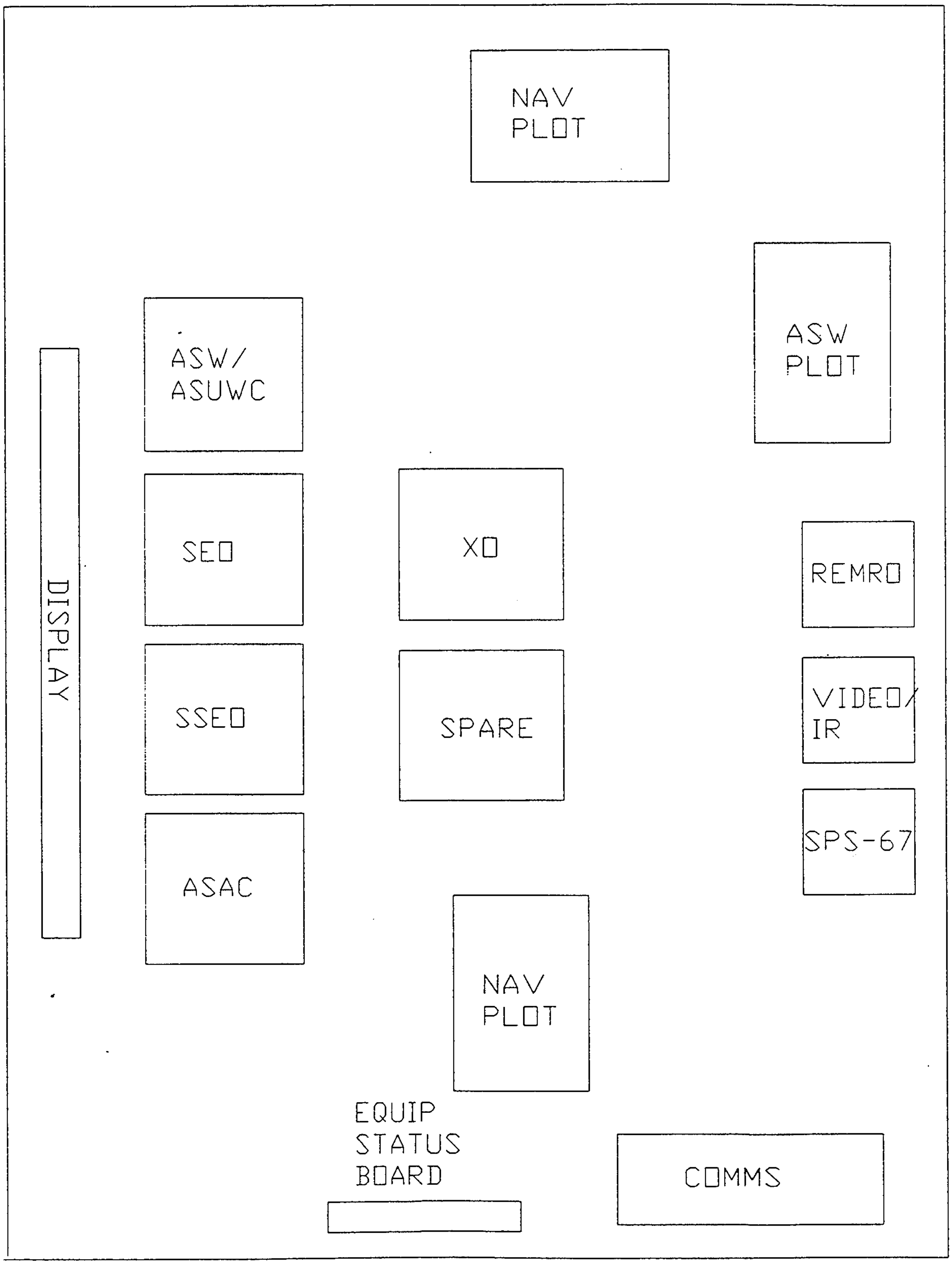
Various topside views of the Coast Guard Variant are included as Insert pages (24) through (30).

# CIC #1



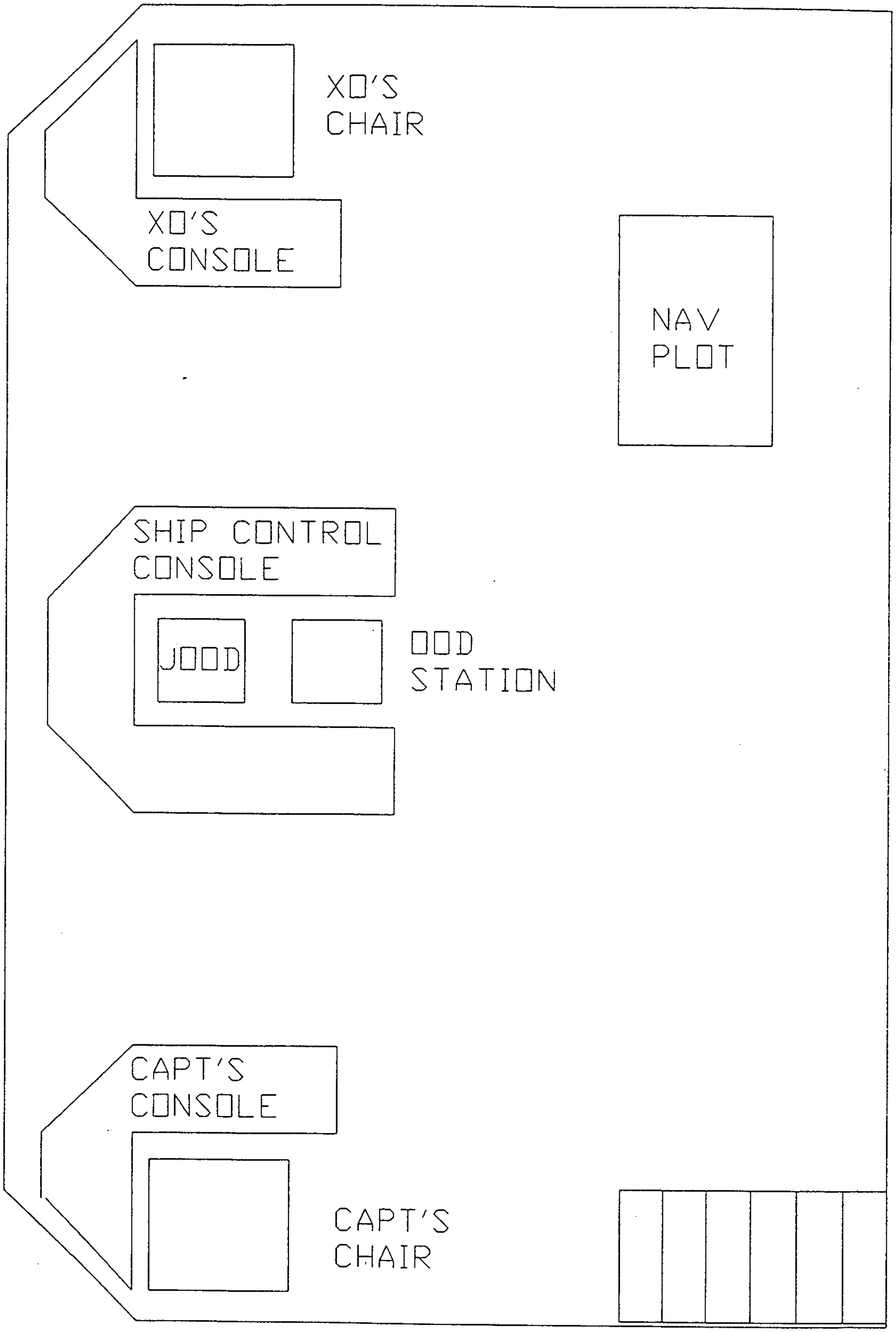

Insert 13

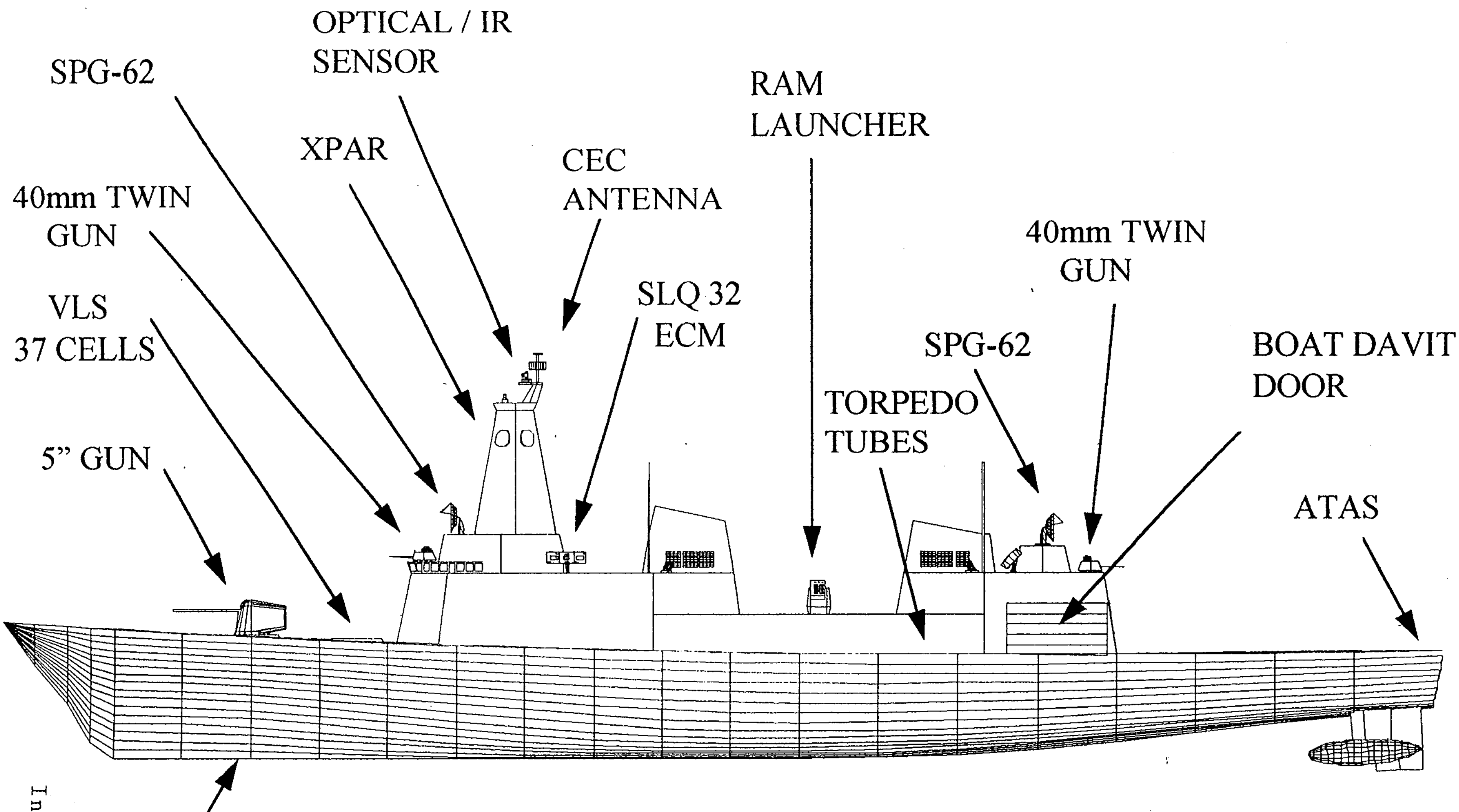
# CIC #2




Insert 14

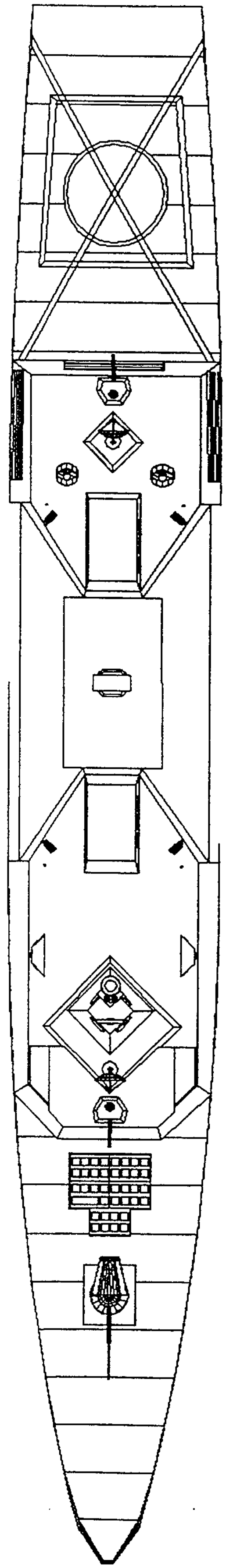
# BRIDGE


XO'S
CHAIR
XO'S
CONSOLE
NAV
PLOT
SHIP CONTROL
CONSOLE
JOOD
OOD
STATION
CAPT'S
CONSOLE
CAPT'S
CHAIR

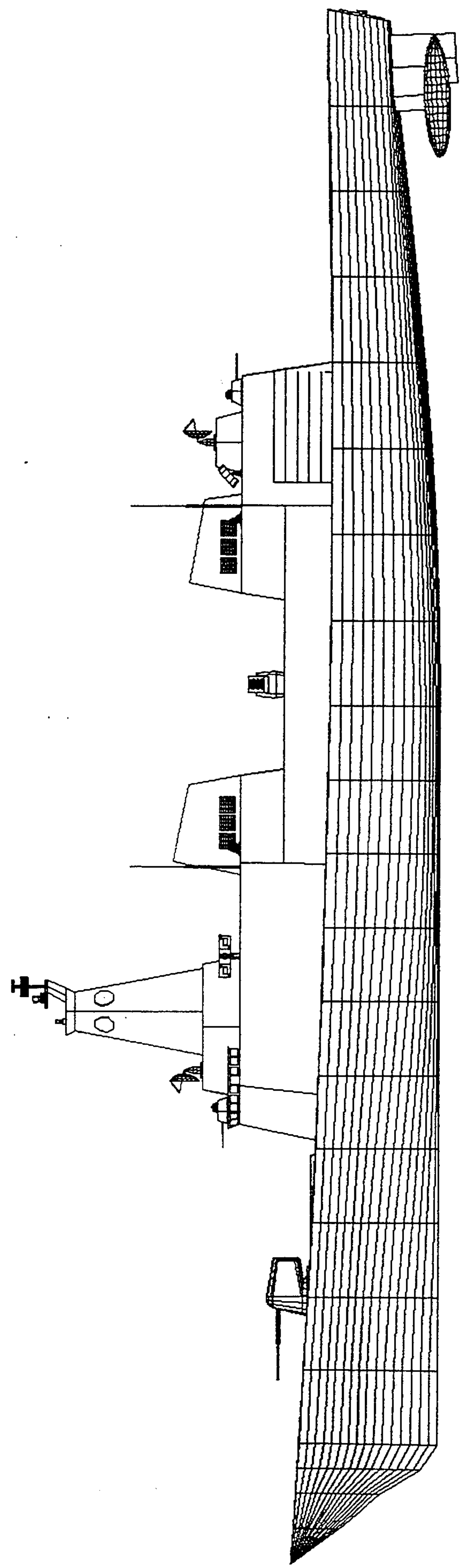



NAVY PAYLOAD

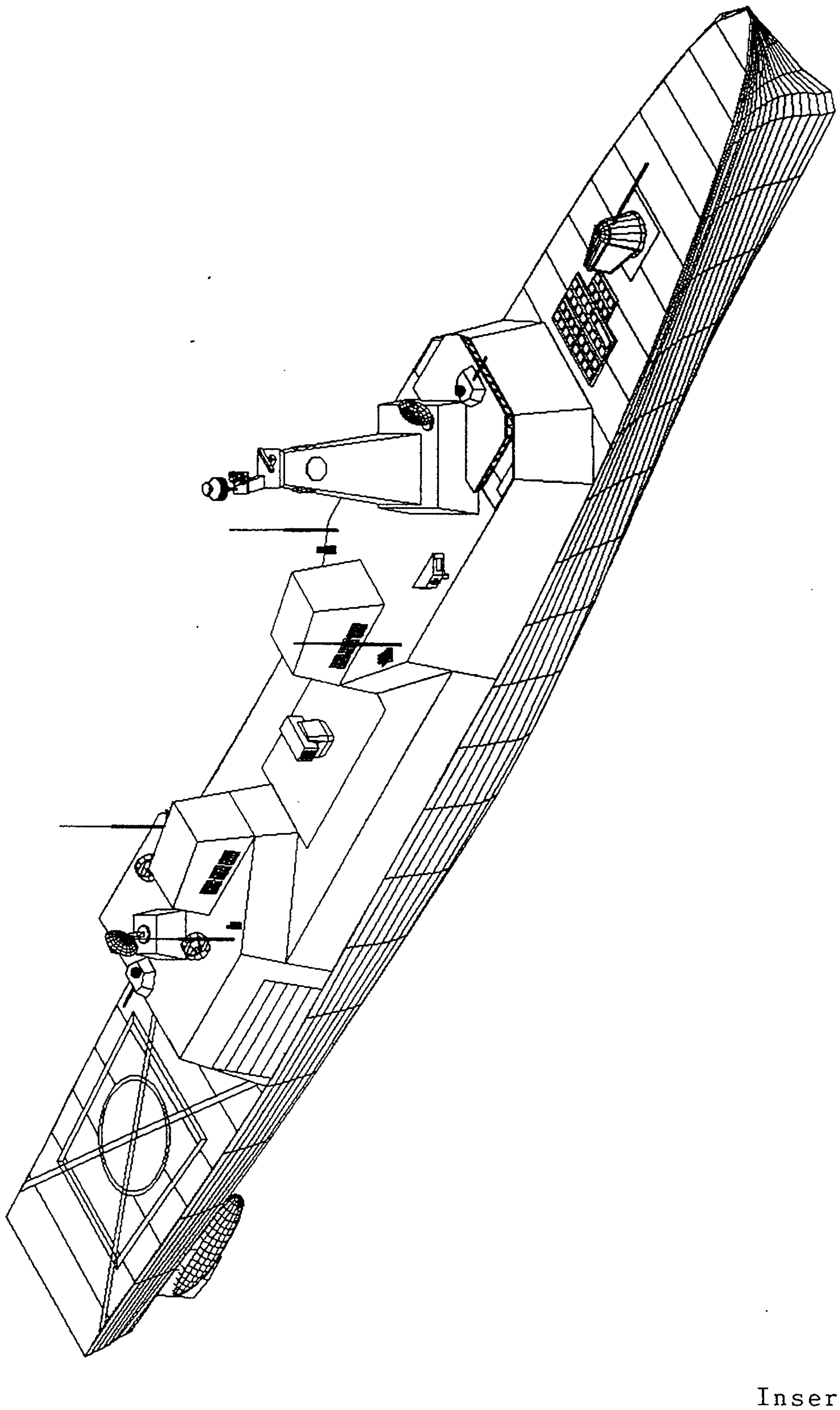
Insert 16



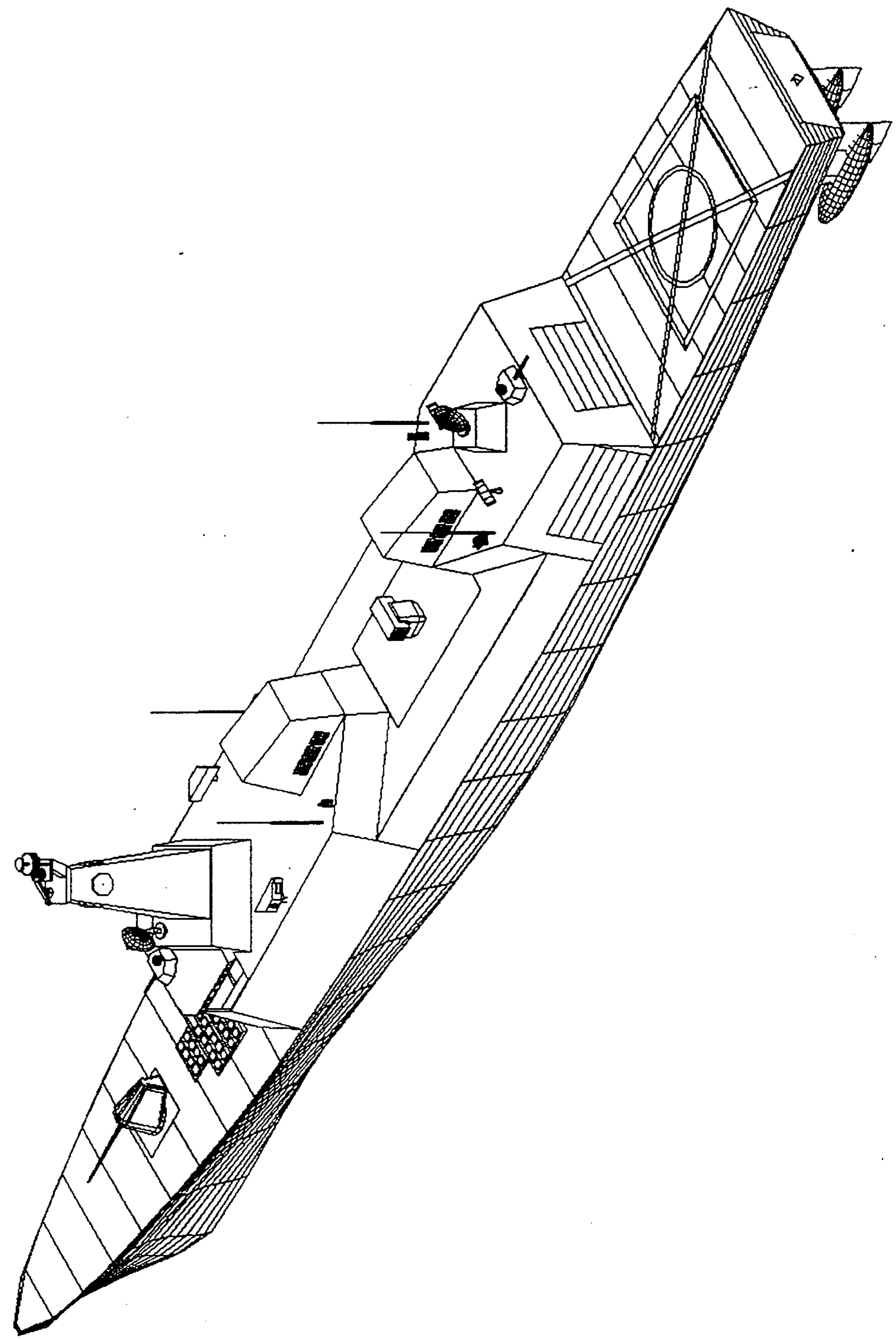
Insert 17



Insert 18



Insert 19



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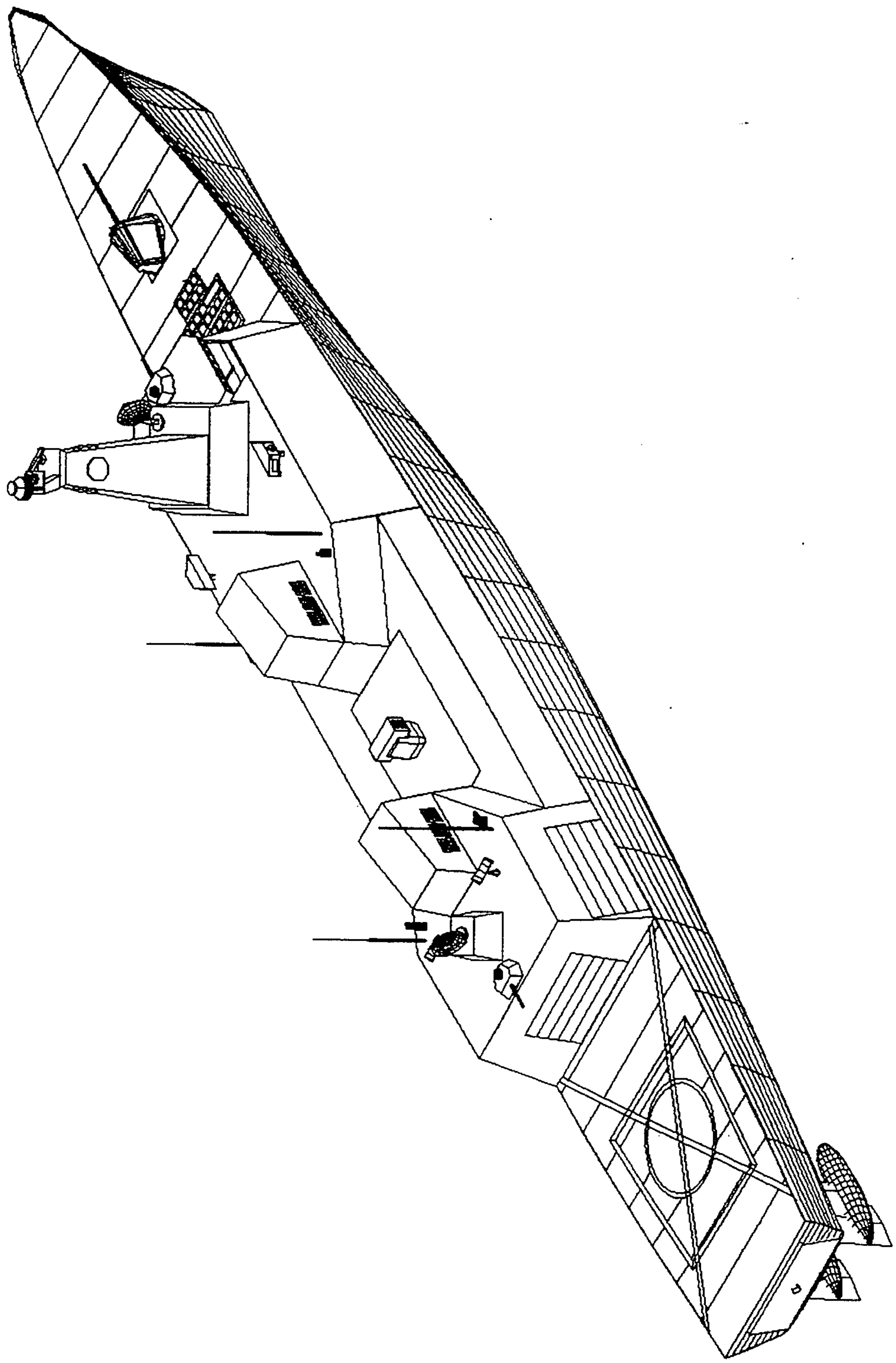

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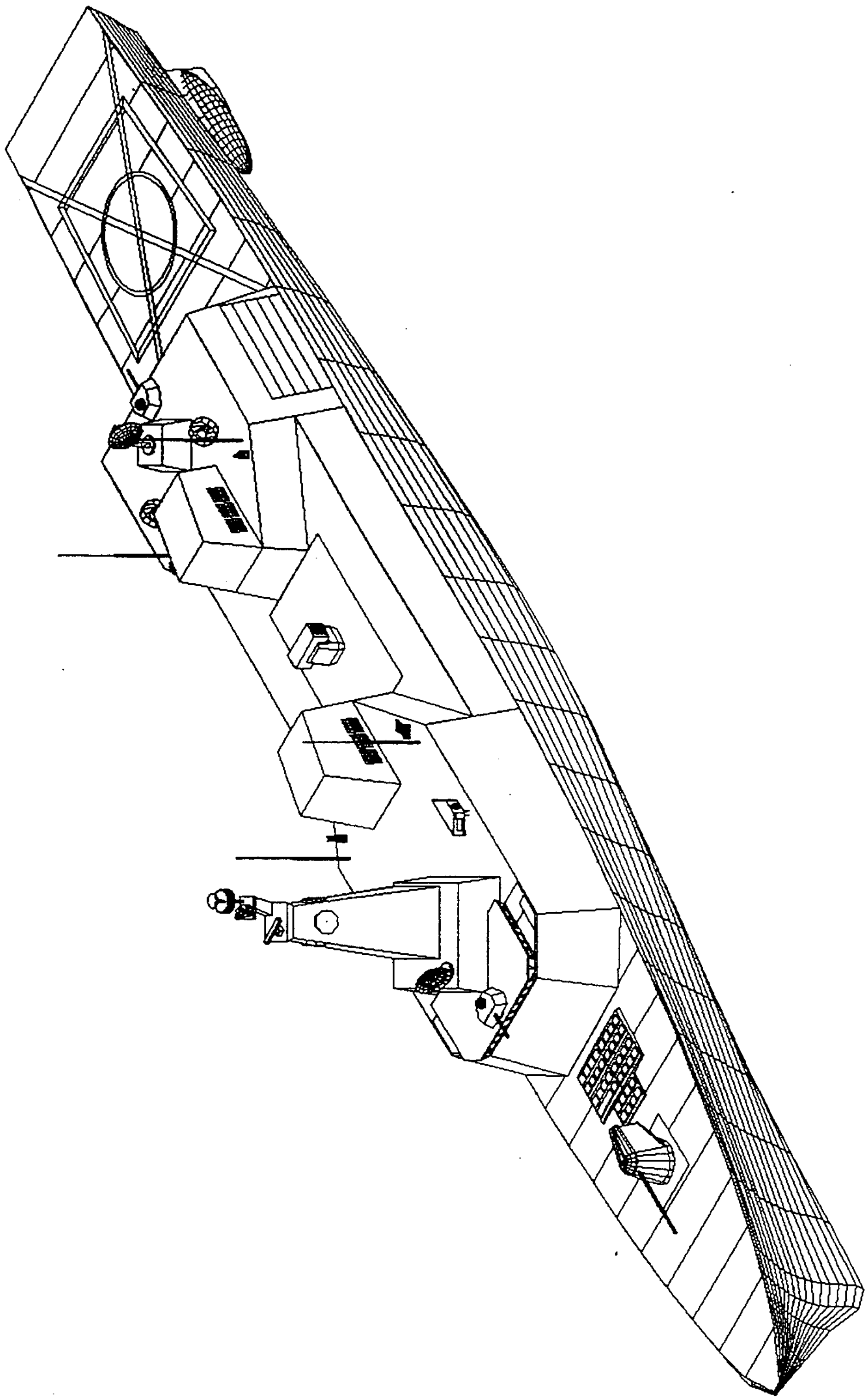
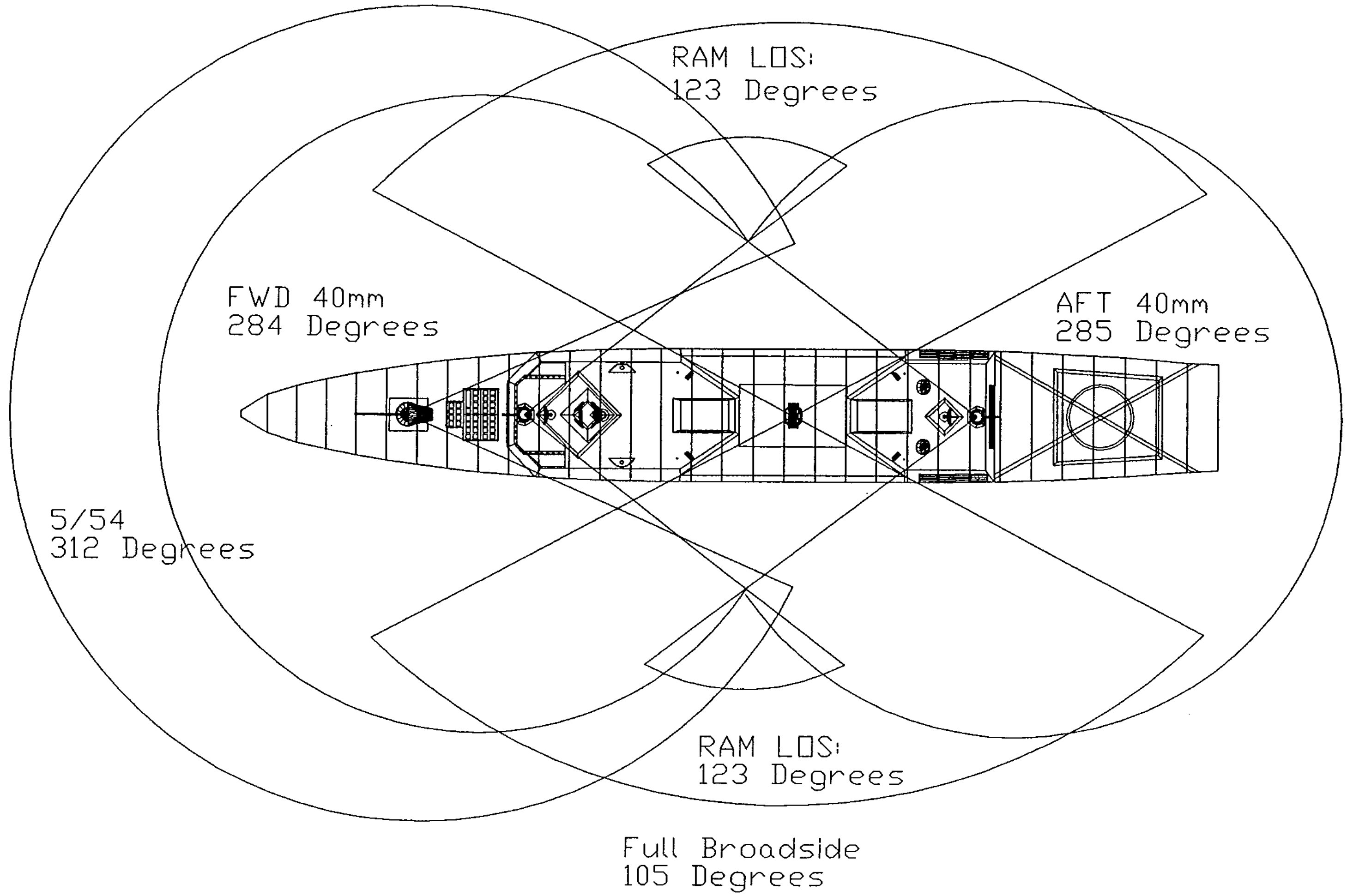
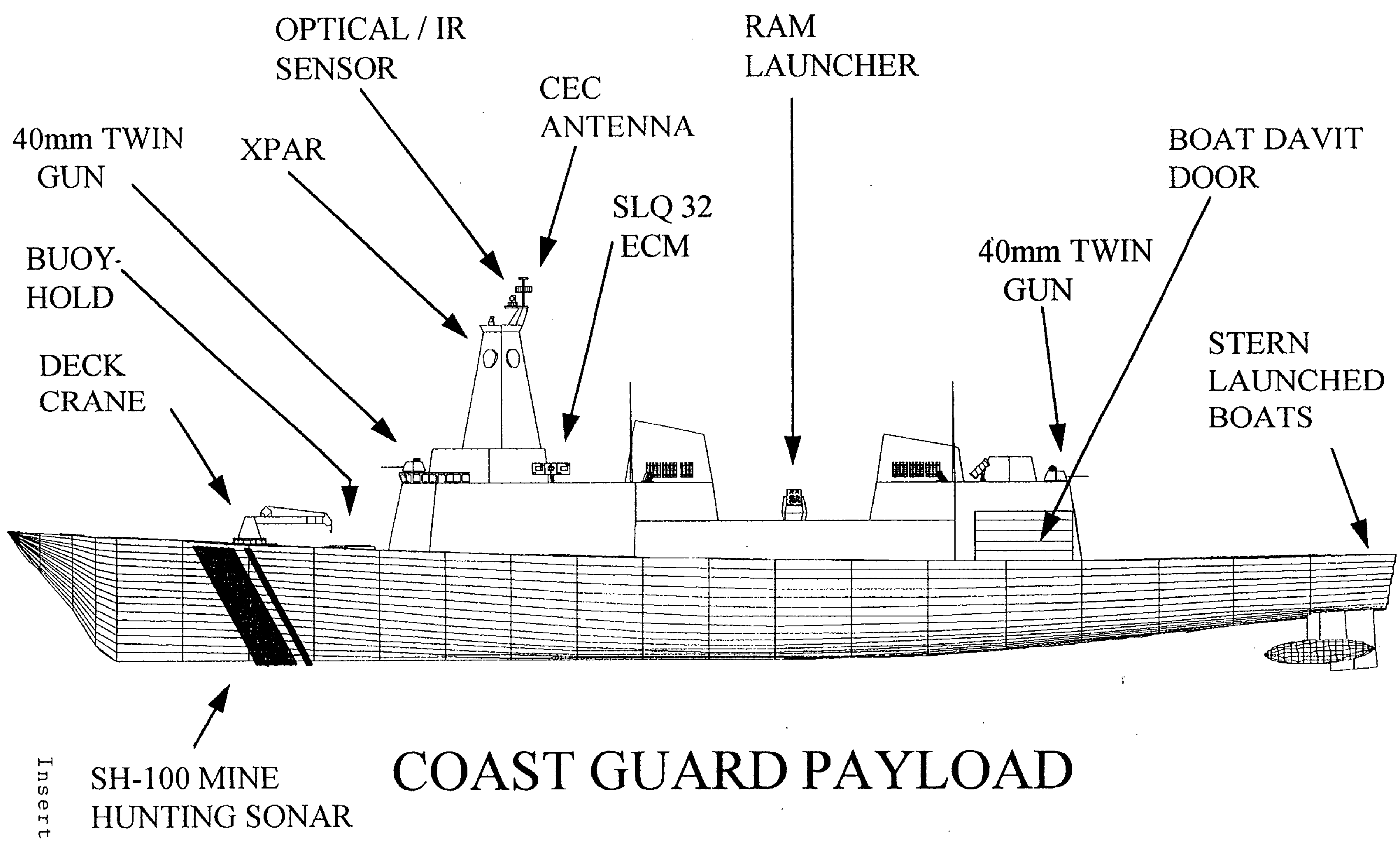


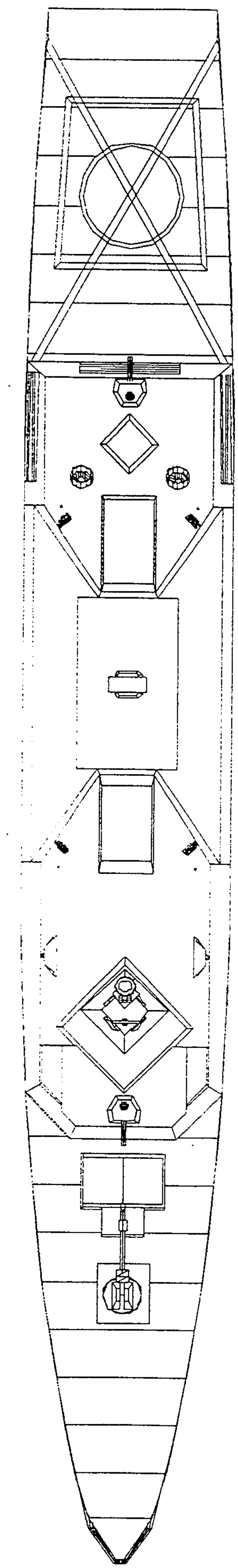
Insert 22

# Weapons Coverage Arcs






# COAST GUARD PAYLOAD



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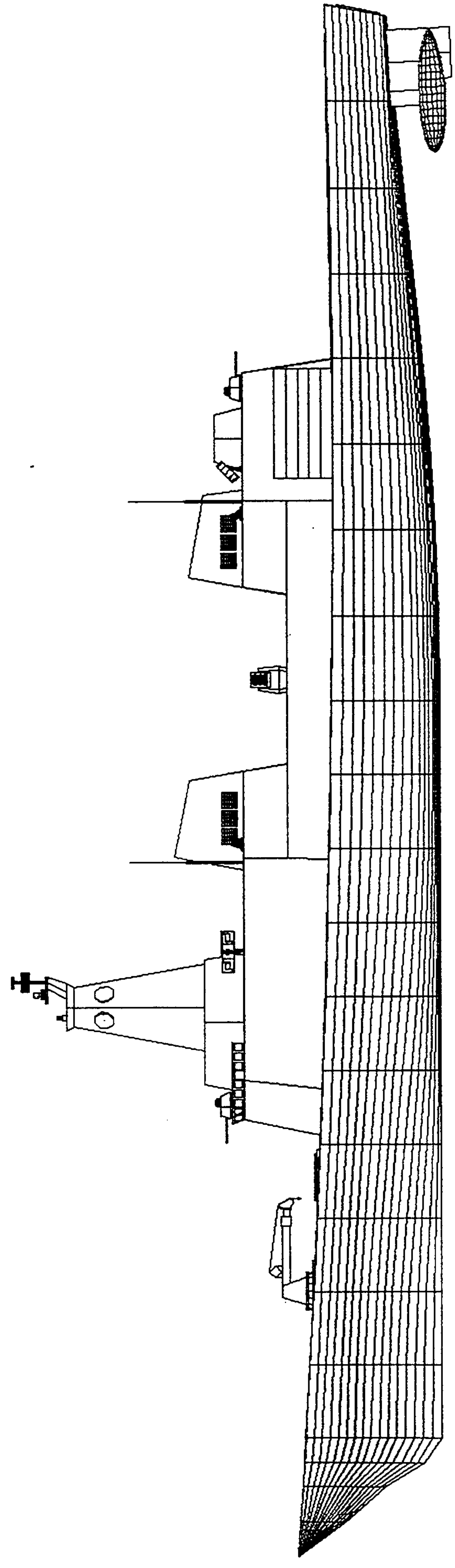

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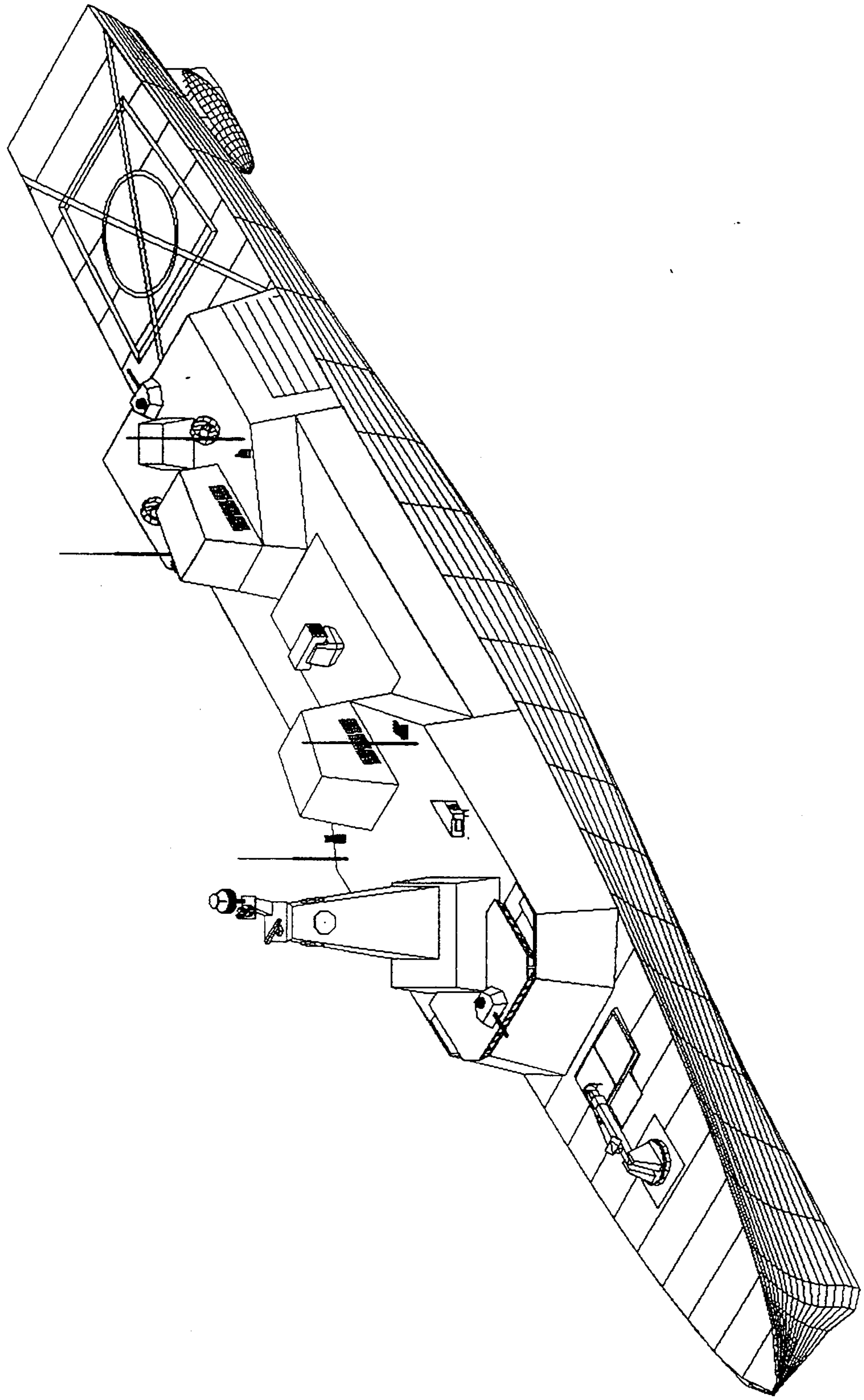

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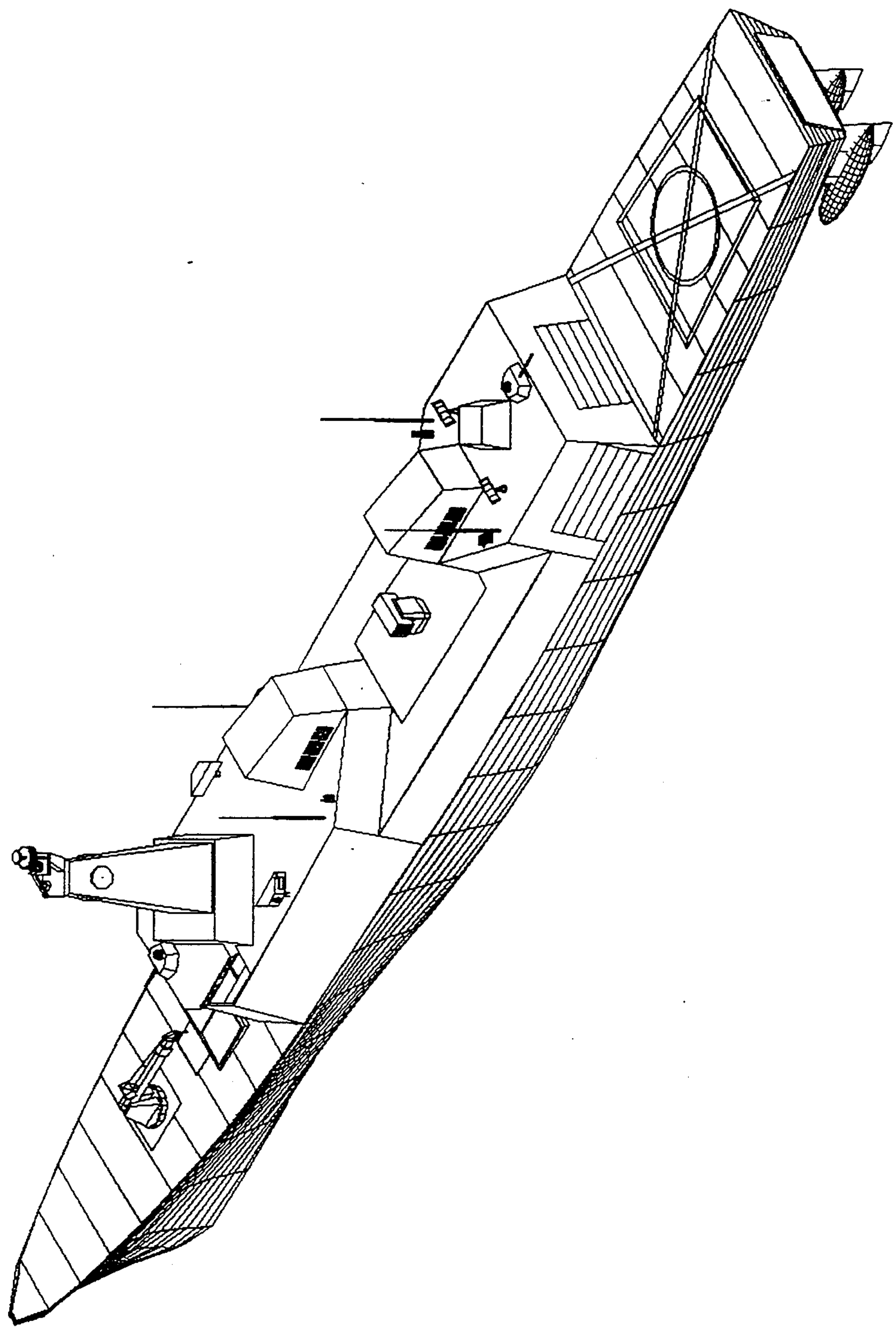

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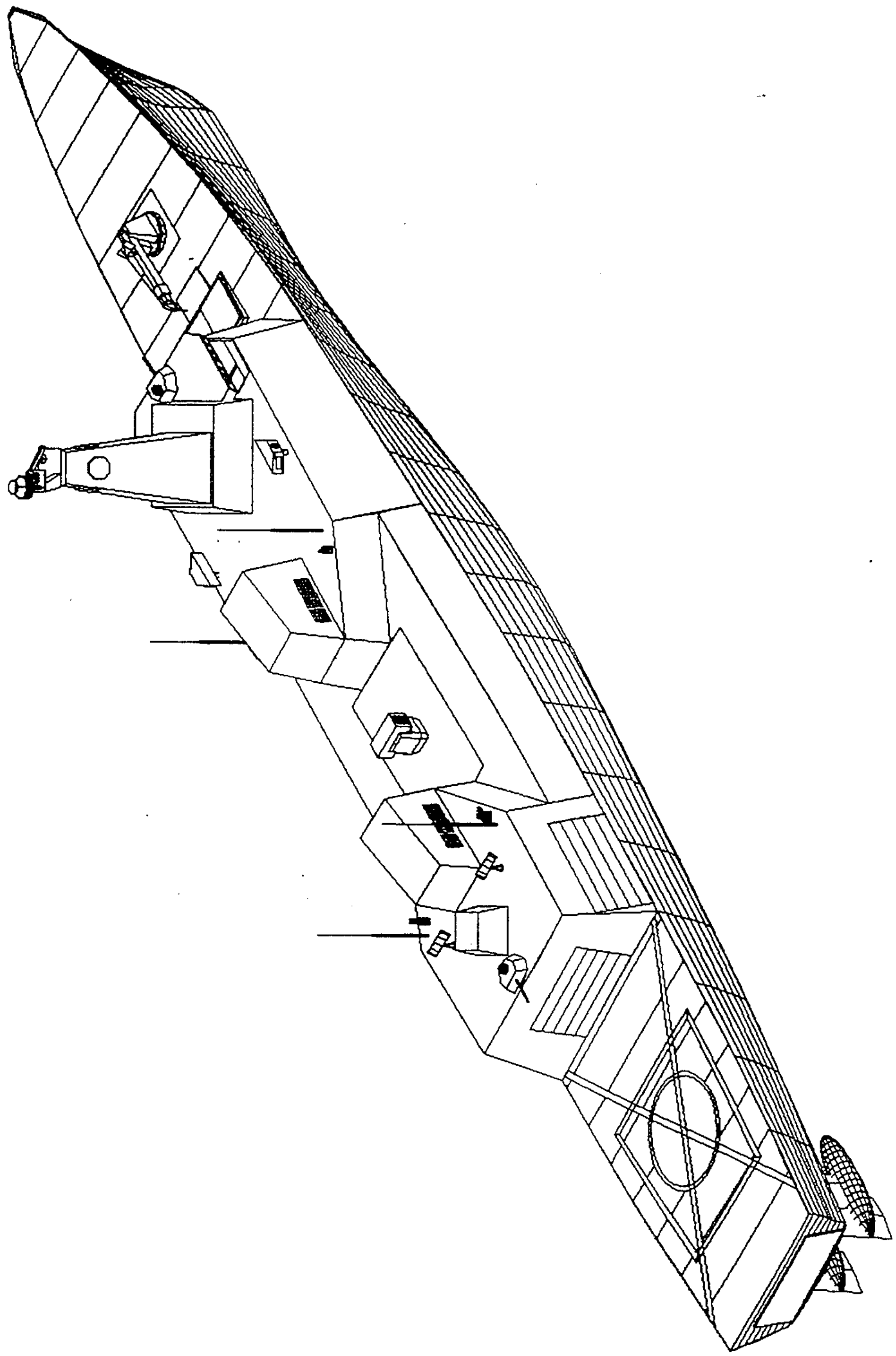

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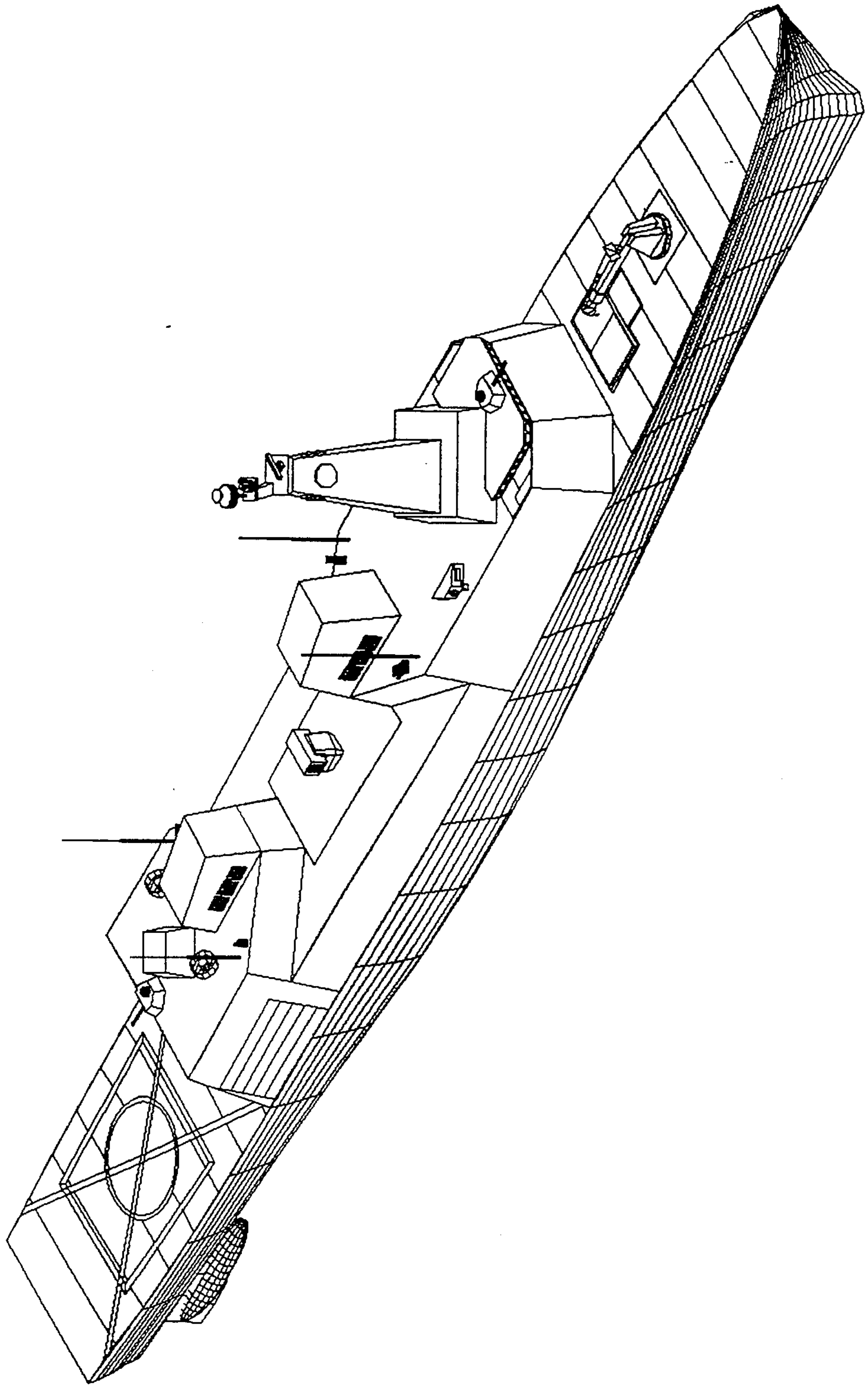


Insert 30

## F. MANNING AND BATTLE ORGANIZATION

### *1. MANNING*

With the requirement of a significant reduction in crew compared to current standards, each position was critically analyzed. Our manning figures were driven by watchstation requirements during General Quarters Condition 1. Two points contributed to our reduction of crew; Service, pay, and health records will be maintained ashore, and major preventative maintenance will be accomplished by shore facilities. Based on our own shipboard experience and our level of automation, these numbers were developed. The manning levels and ratings are included as Tables 1 and 2. Additionally Figures (15) and (16) show the departmental organizational charts for the Navy and Coast Guard. Although this is not a formal manning document, it is an attempt to determine the number of personnel required to man the ship

Navy Variant

| DEPARTMENT | OFFICERS | CPO'S | ENLISTED | TOTAL |
|---|---|---|---|---|
| SHIP SUPPORT | CO, XO, SUPPO (3) | HMC, MSC (2) | MS (3), SH(2) SK(2), YN/PN (8) | 13 |
| COMBAT SYSTEMS | CSO,OPS,EMO, WEPS (4) | BMC, ETC, FCC, GMC, OSC, RMC,STC (7) | BM (8), ET (4), EW (3), FC (4), GM (4), OS (8), QM (2), RM (4), SM, ST (2), TM, (41) | 52 |
| ENGINEERING | CHENG, MPA, DCA, A&E (4) | EMC, ENC, GSC, HTC/DCC (4) | EM (6), EN (7), GS (7), HT/DC (4), MM (2) (26) | 34 |
| AIR DETACHMENT | PILOTS (4) | ATC (1) | AIR CREW AIR TECHS (6) | 11 |
| AVAILABLE MANNING | 15 | 14 | 81 | 110 |

Table 1

Coast Guard Variant

| DEPARTMENT | OFFICERS | CPO'S | ENLISTED | TOTAL |
|---|---|---|---|---|
| SHIP SUPPORT | CO, XO, SUPPO (3) | HSC, SKC, SSC (3) | SS (5), SK(2), YN/PN (8) | 14 |
| COMBAT SYSTEMS | CSO,CICO, WEPS (3) | ETC, FTC, RMC, RDC (4) | ET (5), FT (2), GM (4), RD (8), RM (5) (24) | 31 |
| OPERATIONS | OPS 1ST LT (2) | BMC, QMC (2) | BM (14), QM (3) (17) | 21 |
| ENGINEERING | EO, MPA, DCA, A&E (4) | EMC, MKC (2), DCC (4) | EM (6), MK (16), DC (4) (26) | 34 |
| AIR DETACHMENT | PILOTS (2) | (0) | AIR CREW AIR TECHS (4) | 6 |
| AVAILABLE MANNING | 14 | 13 | 79 | 106 |

Table 2

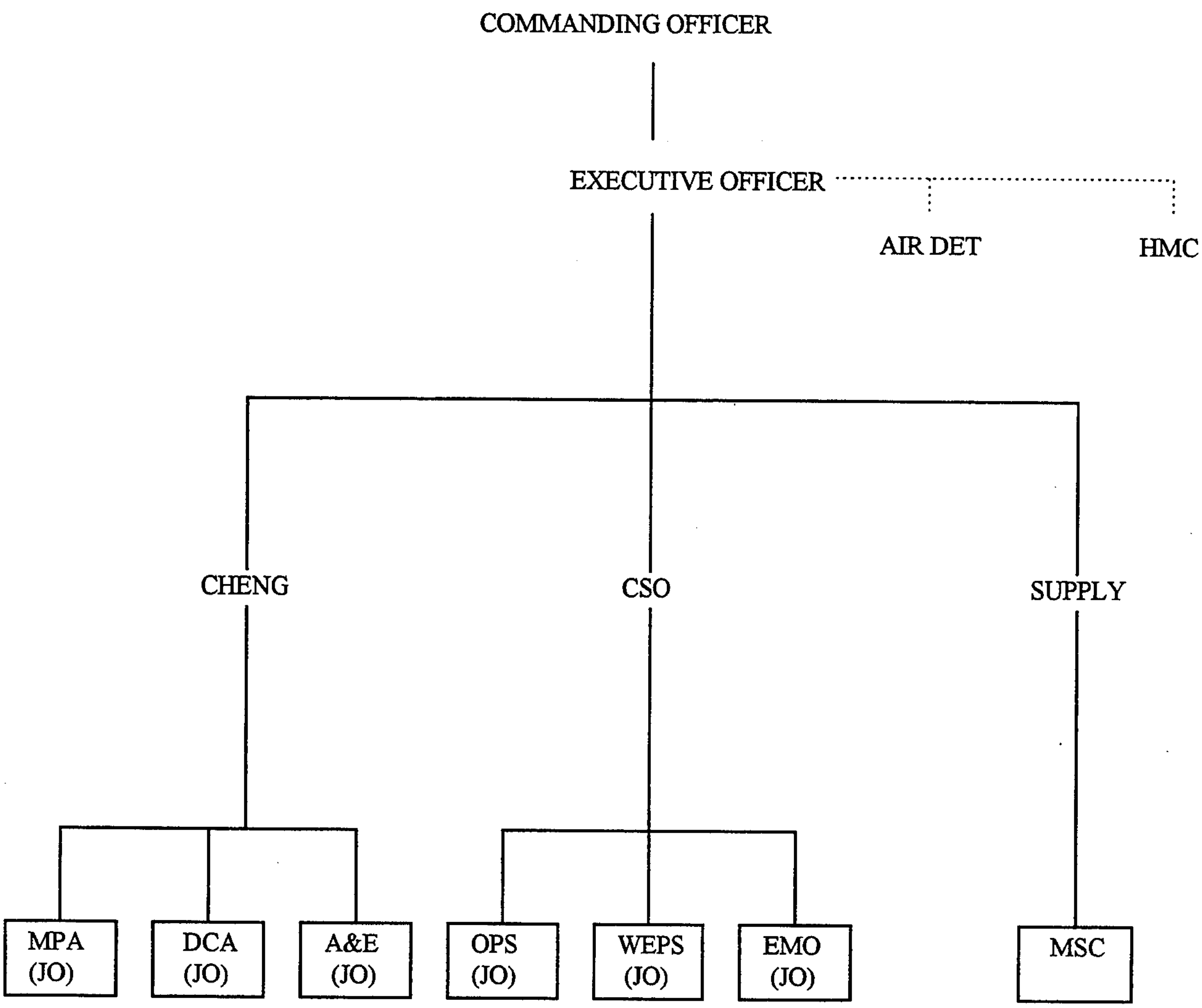



Figure 15 DEPARTMENTAL ORGANIZATION - NAVY

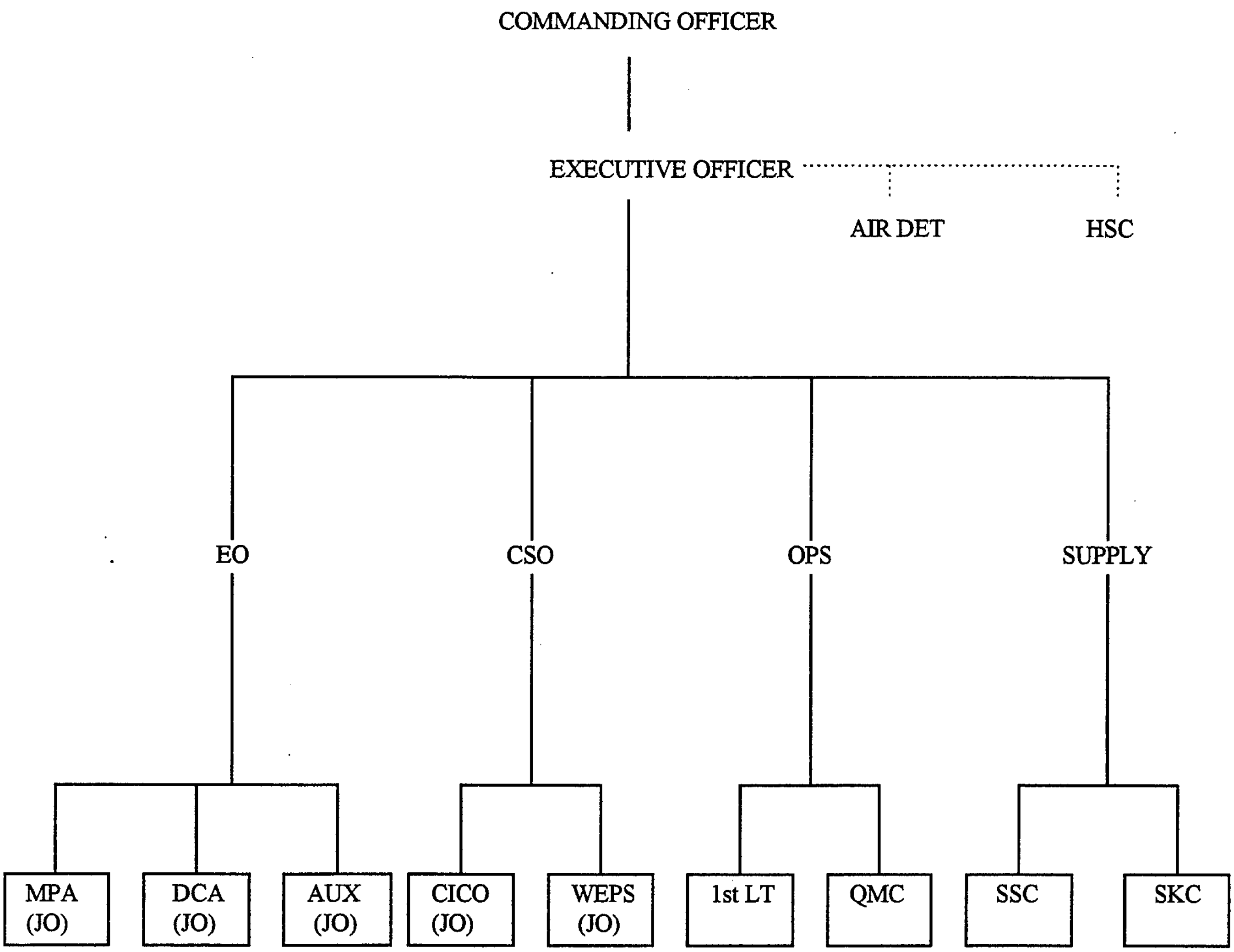



Figure 16 DEPARTMENTAL ORGANIZATION - COAST GUARD

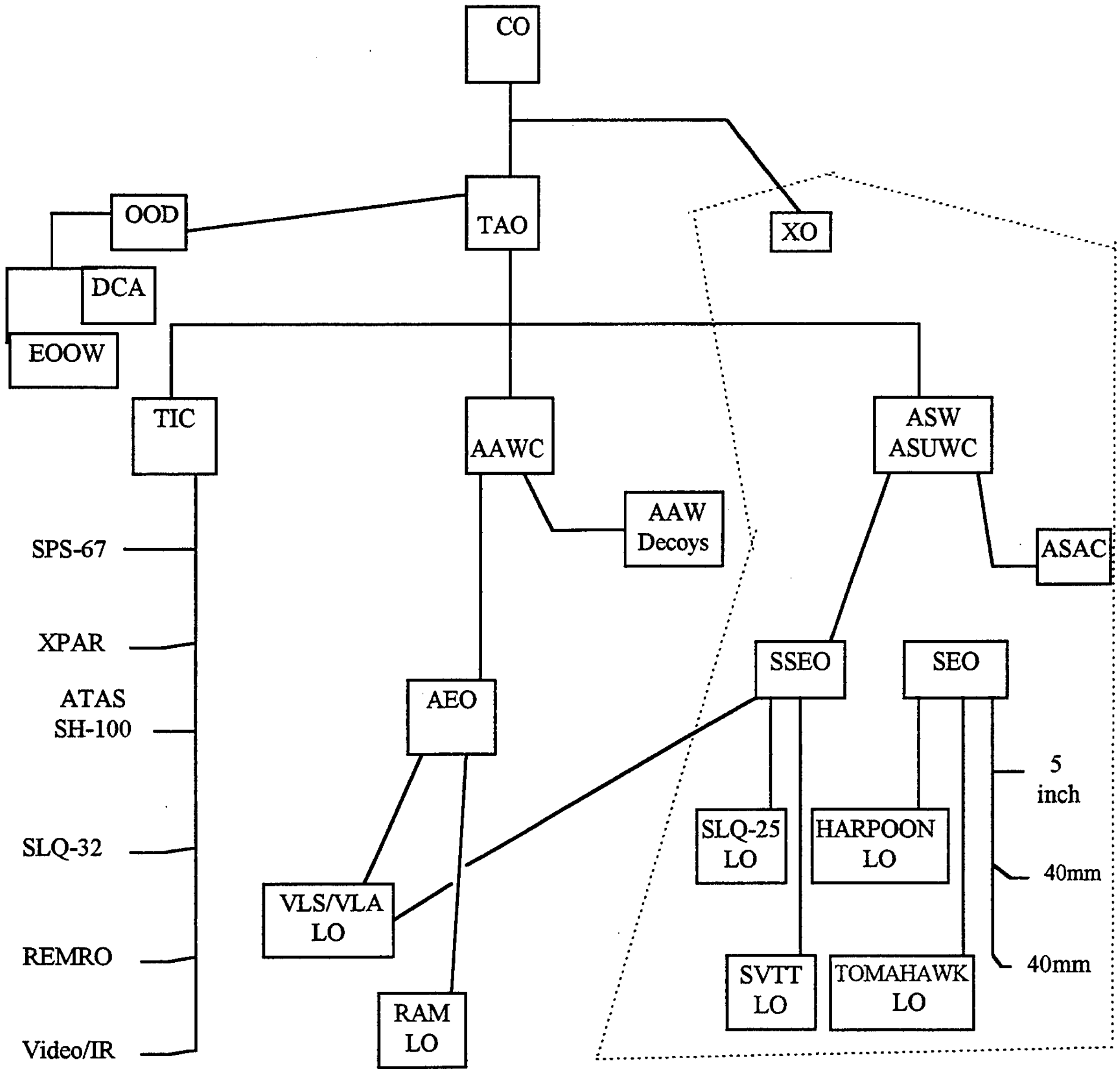
### 2. BATTLE ORGANIZATION

The manning requirements for the ship drive many design parameters, especially in the Combat System area. Manning is primarily driven by watchstation requirements during battle conditions, and to a lesser extent by normal ship operations. The CPCX's Condition I and Condition III Battle Organizations are given in Figures 17 and 18 and 19 and 20 respectively. The connectivity of the watch organization is for supervisory functions only, and has nothing to do with the flow of information to each watch station. Since each watch station will be connected to the data multiplexed ring bus, all watch stations will have access to any desired information. The watch stations that require consoles will be established with either one of two different types:

(a) a multi-purpose console (MMI) capable of performing any watch station function.

(b) or a watch station specific console used only for local equipment control and specific functions.

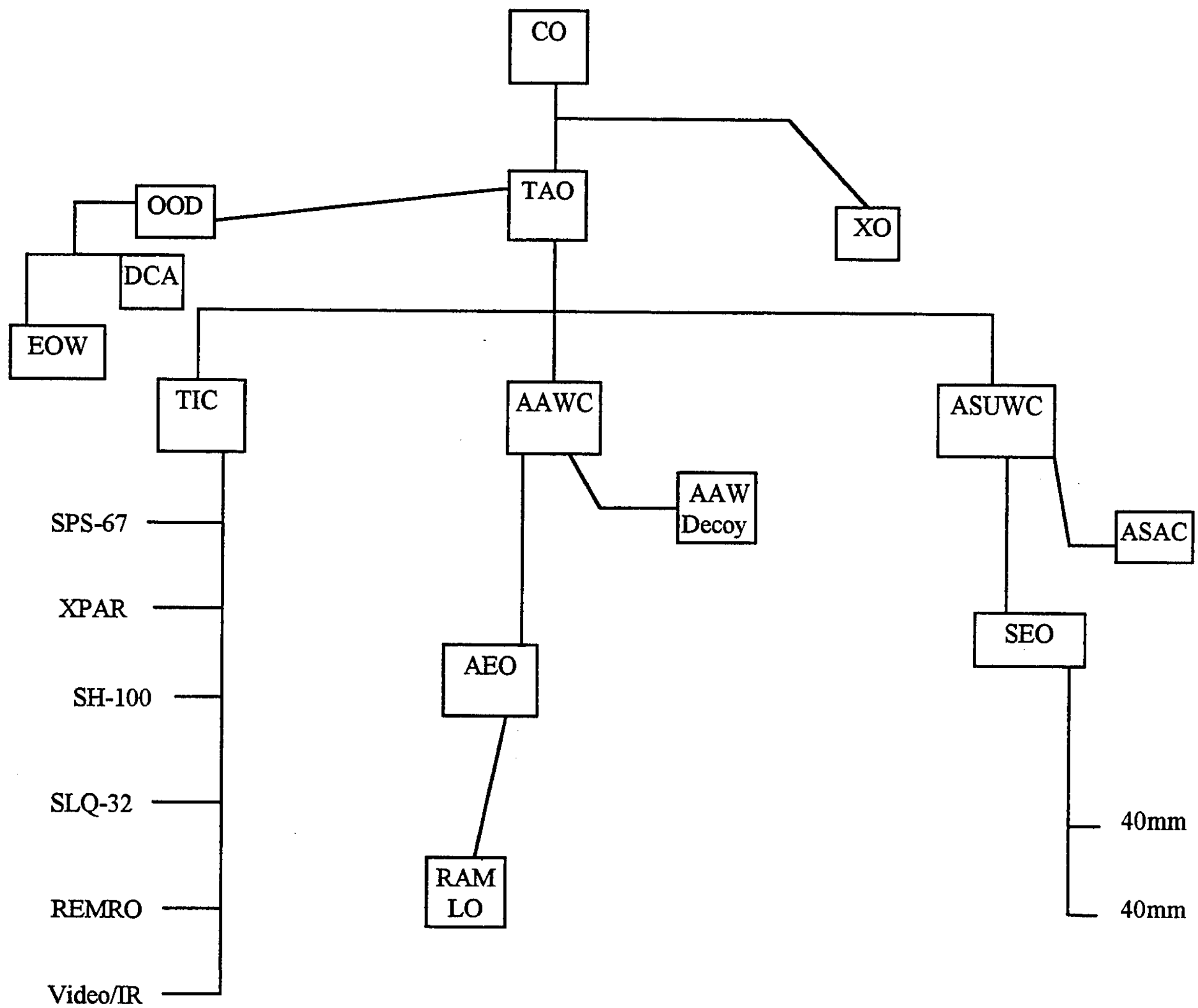
The capability of the combat system watch team during Condition III is that it can fight the ship in a short duration , limited capacity until the ship can man Condition I watch stations. The CPCX's manning will allow, with the exception of radio, all watch stations to be stood in a three section, 4 hours on/8 hours off, watch rotation. This will allow ample time for the off watch sections to conduct training, maintenance and housekeeping.




## LEGEND

| | |
|---|---|
| AAWC | ANTI-AIR WARFARE COORDINATOR |
| ASAC | ANTI-SUBMARINE AIRCRAFT CONTROLLER |
| ASUWC | ANTI-SURFACE WARFARE COORDINATOR |
| ASWC | ANTI-SUBMARINE WARFARE COORDINATOR |
| AEO | AIR ENGAGEMENT OFFICER |
| CO | COMMANDING OFFICER |
| DCA | DAMAGE CONTROL ASSISTANT |
| EOOW | ENGINEERING OFFICER THE WATCH |
| OOD | OFFICER OF THE DECK |
| LO | LOCAL OPERATOR |
| SEO | SURFACE ENGAGEMENT OFFICER |
| SSEO | SUB-SURFACE ENGAGEMENT OFFICER |
| TAO | TACTICAL ACTION OFFICER |
| TIC | TRACK INFORMATION OFFICER |
| XO | EXECUTIVE OFFICER |
| ---- | CIC 2 (ALTERNATE CIC) |

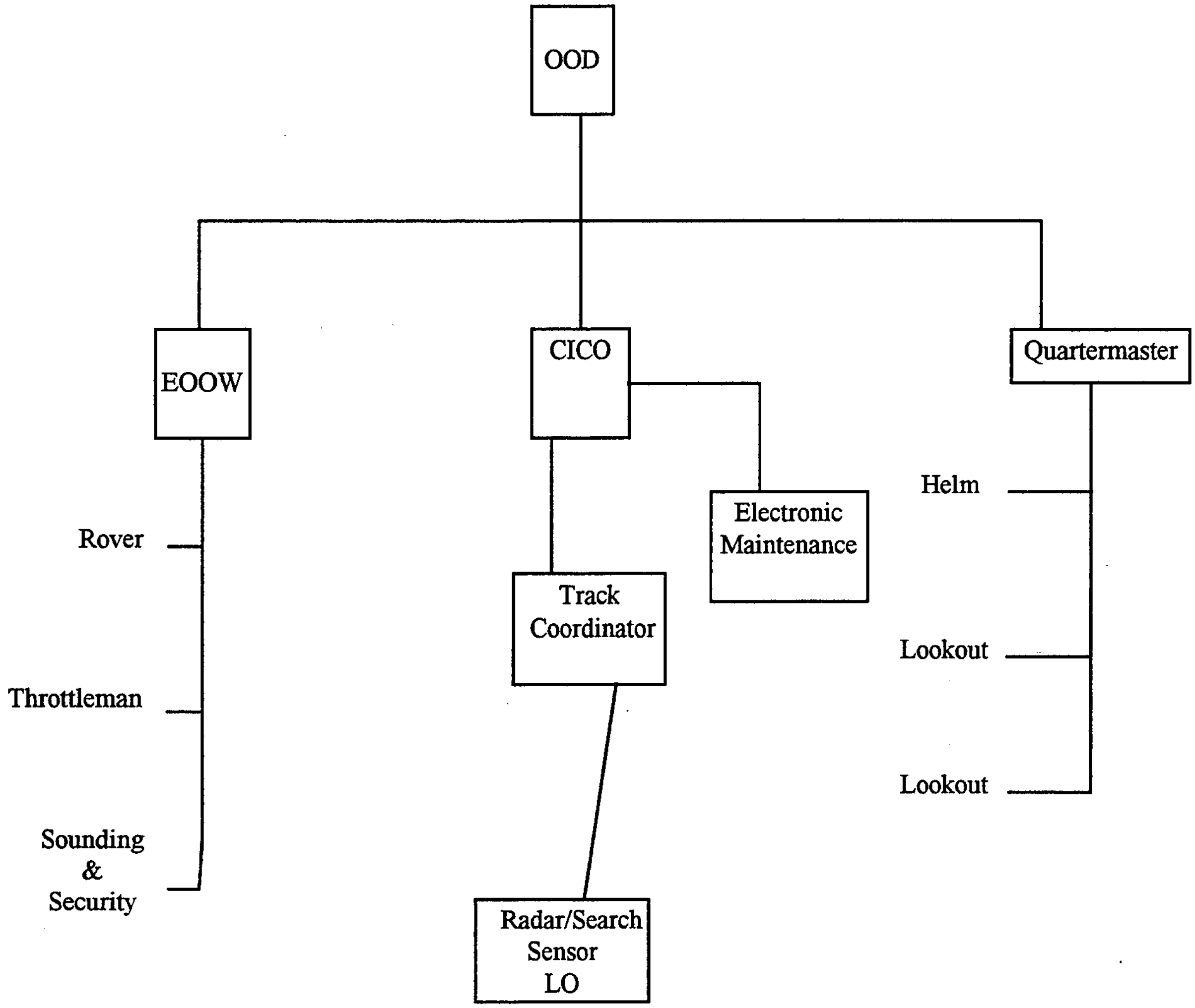
Figure 17 CONDITION I BATTLE ORGANIZATION - NAVY




## LEGEND

| | |
|---|---|
| **AAWC** | **ANTI-AIR WARFARE COORDINATOR** |
| **ASAC** | **ANTI-SUBMARINE AIRCRAFT CONTROLLER** |
| **ASUWC** | **ANTI-SURFACE WARFARE COORDINATOR** |
| **AEO** | **AIR ENGAGEMENT OFFICER** |
| **DCA** | **DAMAGE CONTROL ASSISTANT** |
| **EOW** | **ENGINEER OF THE WATCH** |
| **CO** | **COMMANDING OFFICER** |
| **LO** | **LOCAL OPERATOR** |
| **OOD** | **OFFICER OF THE DECK** |
| **SEO** | **SURFACE ENGAGEMENT OFFICER** |
| **TAO** | **TACTICAL ACTION OFFICER** |
| **TIC** | **TRACK INFORMATION OFFICER** |
| **XO** | **EXECUTIVE OFFICER** |

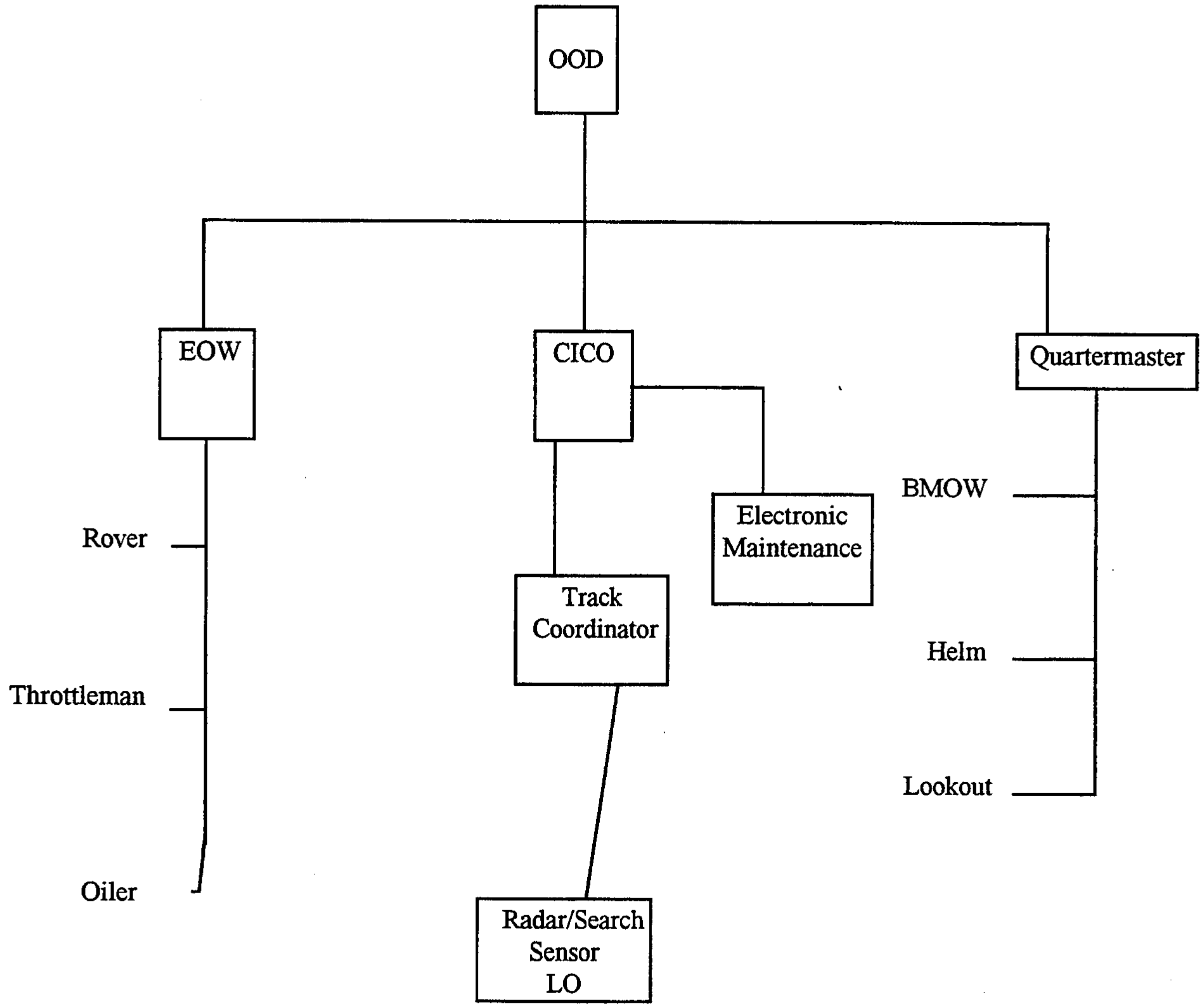
Figure 18 CONDITION I BATTLE ORGANIZATION - COAST GUARD




## LEGEND

| | |
|---|---|
| CICO | COMBAT INFORMATION CENTER OFFICER |
| EOOW | ENGINEERING OFFICER OF THE WATCH |
| OOD | OFFICER OF THE DECK |

Figure 19 CONDITION III BATTLE ORGANIZATION - NAVY




## LEGEND

| | |
|---|---|
| **CICO** | **COMBAT INFORMATION CENTER OFFICER** |
| **EOOW** | **ENGINEER OF THE WATCH** |
| **OOD** | **OFFICER OF THE DECK** |
| **BMOW** | **BOATSWAIN MATE OF THE WATCH** |

Figure 20 CONDITION III BATTLE ORGANIZATION - COAST GUARD

## G. CONVERSION

The ORD dictated the requirement of two ship variants form one hull, one operated by the Navy, the other by the Coast Guard. As much as possible the variants were kept the same to reduce costs and to ease production. The variants differ where it was necessary by due to their different missions. The Navy variant requires a robust self defense capability, some strike capability, and sophisticated air search capabilities. The Coast Guard variant will be used in drug, smuggling, and illegal immigration interdiction, fisheries protection, SAR, escort, and general maritime police duties. In addition, different maximum costs were set for each variant, the Coast Guard variant's being $375 million and the Navy variant's being $450 million. Conversion must take place in under four weeks. Because of these mission differences, the following conversions are required for the Navy variant to become the Coast Guard variant and vice versa.

1. Remove: VLS Install: fuel storage, buoy storage area with sinkers and chain and environmental clean- up gear.

The VLS will be constructed as one unit that can be removed all at once. All missiles will be removed from the ship and then the VLS unit will be lifted out and removed. Associated fire control illuminators will be removed from topside. In its place will be fuel storage tank twelve feet from the keel. A buoy storage room will be on top of the fuel tank. An overboard drainage system will be installed. Flush with the main deck will be a watertight 12'X 12' hatch.

2. Remove: 5" gun Install: buoy crane

Ammunition will be removed from the gun magazine. The ammunition elevator will be removed. A watertight door will be installed at the frame 66' aft of the forward perpendicular. An environmental containment skirt will be stored in the former magazine

and will be assessable by this door. The gun will be removed on the main deck and in its place a crane to lift buoys and the skirt will be installed.

3. Remove: ATAS Install: 2 RHI small boats

The ATAS will be removed from the "well deck". Associated equipment in the well deck will be removed. CIC will remain unaffected. Two RHI small boats will be placed in the well deck. Rails are already in place.

4. Remove: Torpedo tubes Install: Prisoner containment room

Remove torpedoes. Remove "bolt on" torpedo tubes and electrical cabling. Patch opening for torpedoes. Install one commode, shower for prisoner head. Fresh water piping will be pre-staged. Install four sets of bunks, three high.

# V. DESIGN EVALUATION

## A. SURVIVABILITY FEATURES:

The CPCX's survivability characteristics received significant emphasis to support its independent operating nature. Signature reduction was accomplished in three areas by incorporating; radar cross section (RCS) reduction features, infrared (IR) reduction features, and acoustic reduction features. In addition, redundant systems and control spaces further enhance survivability.

The hull, superstructure, and mast consist of flat surfaces, angled at 10 degrees with respect to vertical. All topside equipment such as small boats, deck fittings, torpedo tubes, and miscellaneous gear have been located within the superstructure. These measures will significantly eliminate corner reflectors and reduce the RCS of the CPCX. Further enhancements include the glass reinforced plastic mast and Radar Absorbing Material (RAM) applied to all superstructure and mast surfaces to reduce the reflection of electromagnetic energy.

Infrared cross section reduction methods consist of IR insulation, regenerative gas turbine engines and stack eductors to reduce prime move exhaust temperature.

Acoustic reduction methods include; double sound isolators on the diesel prime movers, acoustic modules on the gas turbine engines, prairie and masker air systems to mask hull noise, and active ship silencing.

The propulsion system was divided among two main engineering spaces located on the 3rd deck. Each engine room contains one diesel and one gas turbine engine to provide main propulsion and electrical power through an electric drive configuration. This propulsion system combined with the DC zonal electrical distribution effectively eliminated all single point failures or "Choke Points" in the engineering system. With a loss of one engine room, the maximum attainable speed is 23kts. In addition, an uninterruptable power supply (UPS) battery is directly connected to the four combat system vital buses. In the event of generator casualties, a seamless transition from primary to alternate power occurs.

Two physically separate CIC's act as a single entity. For the Navy variant, both CIC's are manned during General Quarters. If #1 CIC is lost , the other, although not having as many

consoles, is capable of effectively fighting the ship. For the Coast Guard variant, only one CIC is manned during General Quarters. CIC #2 is capable of fighting the ship if CIC #1 is lost and enough personnel are available to main the alternate space.

Finally, the CPCX's information is distributed through several fiber optic paths in a ring information network. This fiber optic ring allows processing capability to be spread throughout the ship while maintaining a rapid flow of information to all users.

The only single point of failure is the mast which contains the XPAR, surface search radar, forward missile illuminator, IR detectors, and CEC antenna. A casualty to the mast would eliminate navigation and combat systems capability entirely.

## B. FURTHER STUDY

This design is the result of one iteration of the design spiral. Areas that require further attention in subsequent iterations include; the single mast, Coast Guard cost, weight management, cost analysis, and a comparison of CPCX with similar ships.

The air search and surface search radars, as well as other vital equipment, are located on a single mast. Placing a second mast on the ship should be investigated. Alternate locations for topside and other systems would also need to be analyzed.

The Coast Guard is buying high cost sensors for ease of convertibility. Modularized detection elements would eliminate this problem. With the indications provided by future technological areas, this concept is possible.

The CPCX is at the upper limits of its service life weight margin. Critical analysis needs to be completed in this area by compiling more accurate weights and by reevaluating system placement.

Cost data was obtained from the ASSET model. This Cost was calculated using weight based empirical formulas. Future study would require accurate costs provided by manufactures, particularly for new technology systems.

Finally, an effectiveness analysis should be conducted on the CPCX and then compared to other ships with similar size, mission, and payload. This analysis would clearly show which ship is "better".

## C. DESIGN AS A LEARNING TOOL

The value of this design process as a learning tool was in the use of systems engineering principles to design one of the ultimate engineering systems - a multi-mission capable ship. The learning and adoption of a systems engineering approach can be divided into two broad areas. The first area includes the technical or "textbook" aspects of implementing a structured design process that leads to a finished product, in this case a ship design completed through the preliminary design phase. The second area relates to the teamwork or "human" aspects of working on a relatively long term, large scale project as a member of an eight person team. Each of these areas had its related challenges and demands.

The process of transforming operational requirements into a preliminary design demonstrated the multitude of trade-off, optimizations, analysis methods, and engineering judgments that are required for a large system design. The design process using a system engineering approach shed new light on just how integrated ship systems need to be if they are to operate at an optimal level. Progressing from the definition of a need for a new system through to the preliminary design phase with high level of concern for how the various subsystems will integrate to form a whole system is a concept applicable to not just ships or military craft, but any system having two or more components.

The importance of the teamwork aspect to the design process was manifested early. The realization came that in order for any of our ship systems to be integrated, our efforts as a team had to be integrated as well. Everything from previous experience tours to individual schedules and work habits came into play in completing each aspect of the design. The personal experiences, strengths, and interests of each team member had to be considered so that contributions by each team member could be optimized and the common goal of a successful preliminary ship design could be achieved.

## D. CONCLUSION

The CPCX is a multi-mission capable ship that satisfies Navy and Coast Guard needs for a replacement vessel in the year 2010. It is suited for use in littoral as well as blue waters. The

incorporated concept of convertibility allows for a rapid response to ever changing threat environments.

The CPCX meets all requirements as dictated by the ORD. In a successful adherence to our design philosophy, we were able to meet or better the constraints of maximum cost, minimum range, and maximum displacement. In addition, the RCS features previously discussed contribute to the ship's high survivability. The maximum mission effectiveness was achieved by choosing the ship option with the highest measure of effectiveness. A significant reduction in manning was achieved by reviewing current crew positions as well as by incorporating features that implement automation into the design. Our logistics plan along with a menu-driven maintenance system provide the ship with little required maintenance other than basic preventive and essential corrective maintenance. Finally, the quality of life aspect of the crew was important for a minimally manned crew. To improve habitability, crew service spaces were concentrated around the messdecks, the per person space allotment was increased, and recreation spaces were included.

With the items in further study addressed, the design should provide Navy and Coast Guard policy makers a low cost, easily maintainable, minimum manned ship in 2010.

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4. Autocad (v12 & v13)

5. *Advanced Surface Ship Evaluation Tool (ASSET)*, User Manual, David Taylor Research Center, 1990.

### B. Literature

1. *The Naval Institute Guide to Ships and Aircraft of the U.S. Fleet*, 15th Edition, ed. Polmar, N., 1993

2. *The Naval Institute Guide to World Naval Weapons Systems*, ed. Friedman, N., 1989.

3. *Jane's Fighting Ships 1994-95*, Ninety-seventh Edition, ed. Sharpe, R., 1994.

4. *Jane's All The World's Aircraft, 1994-95*, Eighty-fifth Year of Issue, ed. Lambert, M., 1994.

5. *Jane's Naval Weapon Systems*, ed. Hooton, E.,1994.

# APPENDIX A

## THREAT SCENARIOS

## SUMMARY

The initial step in the Combat System selection process is to estimate the future threat scenarios so the CPCX can be designed with a Combat System suite capable of defeating this threat. Threat scenarios were developed to estimate the expected threat the CPCX will encounter beyond an IOC of 2010.

The future threats located on page (A-3) were provided by the faculty advisors. From these future threats, the design teams identified the projected threat environments and selected the possible threats that may be encountered in each environment. The threats were then broken down by specific service. The Navy threat scenarios are located on page (E-4) and the Coast Guard threat scenarios are located on page (E-6). The following letter scale was used to evaluate each specific threat based on the probability of encountering and the capability of that specific threat.

AA - High probability of encountering/High capability threat
AB - High probability of encountering/Low capability threat
BA - Medium probability of encountering/High capability threat
BB - Medium probability of encountering/Low capability threat
CA - Low probability of encountering/High capability threat
CB - Low probability of encountering/Low capability threat
DA - Very Low probability of encountering/High capability threat
DB - Very Low probability of encountering/Low capability threat

# Future Threats

**Missiles:**
A= anti-ship missile, M= other missile

| Designation | Cruise (Mach) | Altitude(ft) | Range (nm) | RCS (dB) | Notes |
|---|---|---|---|---|---|
| A-1 | 4.0 | 150,000 | 200 | -40 | RF(active & passive)/IR/video seeker<br>60 deg dive angle |
| A-2 | 2.0 | 50 | 100 | -40 | 10g termnvr/IR/video seeker<br>terminal alt. 7 ft |
| A-3 | 0.9 | 20 | 75 | -30 | Multiple termnvr/RF/IR seeker<br>A/J |
| A-4 | 0.9 | 10 | 60 | -20 | RF seeker<br>A/J |
| | | | | | |
| M-1 | 2.5 | LOS | 2.5 | -45 | IR<br>shoulder or multi launcher |
| M-2 | 3.5 | Various | 100 | -40 | air launched ARM |

| | Populations: (% of total missile populations) | Distribution: (who owns, # of nations, assuming 250 littoral nations) |
|---|---|---|
| A-1 | 5 | 10 |
| A-2 | 20 | 50 |
| A-3 | 50 | 187 |
| A-4 | 25 | 50 |

**Guns:**
Small arms through 127mm, guided (IR/Laser/RF) and ballistic, ETC and standard propellant.

**Mines:**
Bottom. moored, floating. All influences

**Torpedoes:**
Surface and sub launched. Speeds to 80 kts. Contact/magnetic/acoustic triggers.

**Misc.:**
Mortars, grenades, etc., Chemical and biological agents dispersed through various vectors/methods.

**Note:**
All ASCMs may be launched from air, surface, or subsurface platforms. Any torpedo may be launched from any submarine.

# Navy Threat Scenarios

**1. Independent Operations:**

- Constitutes the high end of low intensity conflict.
- Conduct law enforcement, board and search, drug operations, blockade, Freedom of Navigation (FON), show the flag, Special Operations Force (SOF), intelligence operations, etc. Primarily littoral environments.
- Operate at long distances from the battle group which can also be considered independent operations.
- Reduced signatures are needed for inherent self-defense capability.
- Threat of three missiles in one minute (AA)
- ASCM threats will originate from small fishing vessels and small hostile combatants A-1 (CB), A-2 (CA), A-3 (BA), A-4 (BA)
- Other missiles: M-1 (BB), M-2 (BA)
- Guns (AB)
- Mines (BA), the CPCX may be conducting mine hunting ops.
- Diesel/electric submarines (BA)
- Will likely see a single threat in a single medium (ie. one airplane, one submarine, one missile) vice several threats from various areas.
- CPCX will spend a significant portion of its time at sea conducting independent operations.
- Must have adequate ship self-defense to protect itself.

**2. Group operations without AEGIS support:**

- Part of ARG or SAG (non-Aegis)
- Significant contribution to the fleet will include ASW capability, early warning air detection, and mine hunting.
- CPCX in this scenario will be conducting ASW, escort ops, and/or mine hunting
- These scenarios tend to be more blue water oriented. (No matter how "littoral capable" we design the CPCX it will still be expected to operate in blue water with the fleet.)
- CPCX will operate along threat axis (50-150 mi.) ahead of group.
- The CPCX will not have the support of Aegis cruiser/destroyer.
- Air defense (if required) will be provided by missile shooters (NTU CGN, DD with VLS, FFG)
- Mines (CA) less likely in this scenario. (blue water nature)
- The probability of seeing missile A-1 (DA)
- ASCM threat: A-2 (AA), A-3 (AA), A-4 (AA)
- Other missile threat: M-1 (DB), M-2 (AA)
- Missile M-1 is very short range and difficult to counter.
- Missile threat includes three incoming missiles in one minute.
- Diesel/electric submarines (AA)
- Guns (AB)
- This scenario will be the most demanding scenario for the CPCX. Other ships will be present, but CPCX will not have the Aegis umbrella for protection.

**3. Group operations with AEGIS support:**

- This scenario will be similar to above but the CPCX will have the assistance of an AEGIS cruiser/destroyer. Part of CVBG or SAG.
- Aegis will provide long range air search and air defense.
- CPCX will operate along threat axis (50-150 mi.) ahead of Aegis for ASW capability and early warning air detection an tracking. Can provide Aegis with "heads up" to possible incoming air attack.
- Missile threat is high, but the missile most difficult to counter A-1 (CA) will most likely be targeted for other platforms such as Aegis/CV/LHD, not CPCX.
- Missile threat: A-2 (AA), A-3 (AA), A-4 (AA), M-1 (DB) and M-2 (AA)
- missile M-1 and M-2 are very short range and difficult to counter
- Missile threat includes three incoming missiles in one minute.
- Diesel/electric submarines (AA)
- Guns (BB)

# Coast Guard Threat Scenarios

**1. Independent Operations: Routine ELT Patrol:**

- Fisheries : belligerent fisherman using primitive small arms, large fishing vessels attempting to ram. Threats: M-1 (CB), small arms (BC).
- AMIO: large numbers of migrants, non-threatening unless actually aboard own vessel. Riot risk, possible takeover attempts (internal security issue). Threats: small arms (BC).
- Drug Interdiction/Smuggling/Piracy (AA): high speed surface and aircraft, equipped with high tech small arms, OTS (over the shoulder) missiles, rocket propelled grenades. Threat: A-4 (DA),M-1 (CB)
- Territorial/Sovereignty issues: Foreign governments desiring to make a "statement" concerning Freedom of Navigation issues, international waters fishing treaties (i.e. Recent Canada/Spain fishing rights dispute). May involve use of covert special forces aboard commercial vessels, using a few, but very potent high tech weapons. May also involve shore based threats (aircraft, missiles, gunboats, etc.) if operating near or in foreign littorals (but in international waters). Threat: A-3 (DA), A-4 (CA), M-1 (CB), M-2 (DB).
- Underwater Terrorism: In US port or foreign port, factions placing mines on ship. Terrorist swimmers harassing ship, trying to come aboard, trying to sabotage. Threat: mines (DA).

**2. Low Intensity/Group Operations**

- Support of limited invasion operations of Third World nations. In concert with other Navy/Coast Guard forces, generally in own hemisphere, i.e. Haiti, Grenada, Panama. May be first US asset on scene. Threats include aircraft and/or small warships (corvette size or smaller). Very limited high tech threats, but abundant weapons of 1990's technology. Threats: A-3 (CA), A-4 (CA), M-1 (BB), M-2 (CB).
- Foreign littorals: UN/US Economic sanctions, embargoes. Commercial ships that are intercepted may contain OTS missiles, small arms. Ramming also a possibility. Threats: M-1 (CB).
- Escort duties for allied shipping in US and foreign littorals. Threats include small surface/sub-surface craft, aircraft and mines. Threats: A-3 (CA), A-4 (BA), M-1 (AB), M-2 (CA). Harbor control duties in foreign ports in support of inland operations. Small surface/sub-surface craft, and mines are potential threats. Threats: A-4 (CA), M-1 (BB), M-2 (CB), and mines (BA)

**3. Battlegroup Operations:**

- Against First World high tech threats. Involvement limited to configuration capabilities. A-1 (CA), A-2 (CA), A-3 (CA), A-4 (BA), M-2 (CB), torpedoes (BB), mines (AA), misc. (BB)

# APPENDIX B

## COMBAT SYSTEM REQUIREMENTS

## Summary

This Appendix (B) contains the Combat Systems requirements broken down by common requirements for both variants, Navy specific requirements, and Coast Guard specific requirements.

## COMBAT SYSTEMS REQUIREMENTS

**Category A** - Both Variant Specific Requirements

1. Fully inter-operable with other Naval expeditionary, interagency, joint and allied forces.
2. Broad band sensor suite (open ocean and close to land) with minimal detection degradation.
3. Communications suite must have an integrated database capable of interfacing in a Joint Task Force/Combined Task Force (JTF/CTF) environment to include compatibility with joint systems such as the Global Command and Control System (GCCS) and the Joint Worldwide Intelligence Communications System (JWICS). The ship must have a full suite of radios and antennas to support full connectivity via EHF/SHF/UHF/SATCOM.
4. Stop, board and disable other vessels.
5. Embark and support armed rotary-wing aircraft, and conduct rotary-wing aircraft operations.
6. Small boats , minimum capacity of 8 people, up to sea state 4.
7. Humanitarian assistance in the form of at sea rescues, emergency medical care, sustenance and protection.
8. Coastal intelligence gathering.
9. Conduct and support special operation forces worldwide.
10. Support the equipment and personnel of a mine disposal system.
11. Have a reduced electronic, magnetic, thermal, and acoustic signature.
12. Modularized mission specific items for future updates will be used and will lend toward quick conversion between variants.
13. Minimization of crew size while maintaining capability is essential.

**Category B** - Navy Specific

1. Destroy or neutralize enemy targets afloat and ashore through the use of coordinated, precision strike weapons.
2. Provide firepower support for amphibious and other ground forces.

3. Detect, identify, and engage air, surface, and underwater threats.
4. Perform ship self defense against foreign military enemies and civilian terrorists at sea and in port.
5. Defend itself against raids comprised of 3 ASCMs arriving within a one minute.
6. Conduct engagements cooperatively with other ships, submarines, aircraft, space systems, and land systems.
7. Detect and chart underwater mines.

**Category C** - Coast Guard Specific

1. Detect, identify, and engage air and surface threats.
2. Perform ship self defense against foreign military enemies and civilian terrorists at sea and in port.
3. Conduct engagements cooperatively with other ships, military and civilian aircraft, and land systems.
4. Detect and chart underwater mines.
5. System for prisoner containment.
6. Transport and station small navigational buoys.
7. Assist in the containment of oil spills.
8. Be capable of joining the Naval fleet in joint operations and in time of war.

# APPENDIX C

## COMBAT SYSTEMS ELEMENTS CONSIDERED

## SUMMARY

A summary of Combat System elements considered for the CPCX design is contained in the following appendix. The design teams researched guns, ASW sonars, air /surface search sensors, missiles, mine hunting devices, and small boats from various countries. This provided a database of current weapon systems and their capabilities from which the design teams could pick the elements needed to satisfy given requirements and meet projected threats.

# GUNS

**LARGE**

| Name | Weight | Rate | Ranges (surface/AA) | Source |
|---|---|---|---|---|
| 5"-54 MK 45 | 24.27 t | 16-20 rds/min | 12.4 nm / 15 km | US |
| Oto Melara 127 (Alleggeritto) | 20.5 t | 45 rds/min | 8.6 nm / 13.6 km | Italy |
| Vickers 4.5" | 23.25 t | 25 rds/min | 11.9 nm | UK |
| Bofors TAK 120 | 28.8 t | 80 rds/min | 10 nm | Sweden |

**MEDIUM**

| Name | Weight | Rate | Ranges (surface/AA) | Source |
|---|---|---|---|---|
| Greusat-Loire 100 | 13.5 t | 10,40, 90 rds/min | 9.15 nm / 6 km | France |
| Oto Melara 76 | 7.5 t | 80 rds/min | 16 km | Italy |
| Bofors TAK 76 | 6.5 t | 30 rds/min | 6.8 nm | Sweden |
| Bofors 40 | 5.6 t | 600 rds/min | 6 km / .4 km | Sweden |
| Breda Fast 40 | 6 t | 900 rds/min | 6.75 nm / 8.7 km | Italy |
| Trinity 40 | 4000 kg | 330 rds/min | 1.61 nm / 6 km | Sweden |

**SMALL**

| Name | Weight | Rate | Ranges (surface/AA) | Source |
|---|---|---|---|---|
| Mk 88 Bushmaster 25 | 589 kg | 180 rds/min | 1.33 nm | US |
| Giat 20 | 222 kg | 650 rds/min | 1 nm | France |
| Oerlikon 20 | 500 kg | 800 rds/min | 1 nm | Int'l |

**ANTI-SHIP MISSILE DEFENSE**

| Name | Weight | Rate | Range | Source |
|---|---|---|---|---|
| Midas 27 | 4.6 t | 7200 rds/min | | Germany |
| Myriad 25 | 7700 kg | 10,000 rds/min | 1.07 nm | Italy |
| Sea Zenith 25 | 5450 kg | 3400 rds/min | 1.07 nm | Switz |
| Goalkeeper 30 | 6800 kg | 4200 rds/min | 1.61 nm | Neth |
| CIWS 20 | 6.18 t | 4500 rds/min | .75 nm | US |

**NEW TECHNOLOGIES**

ETC: Liquid propellant, Large mounts only
Rocket Assisted Projectiles
Guided Munitions: Command Guidance, IR seeker, laser designator, Semi-active

# ASW SONARS

## HULL MOUNTED

| Name | Frequency | Weight | Source |
|---|---|---|---|
| AN-SQS 505 | 5.4 KHz | | Canada |
| Type 5051 (505 improved) | 5.4 or 7 KHz | | Canada |
| Diodon | 12 KHz | 1500 kg | France |
| PHS-32 | 3 freqs | 2500-8000 kg | Neth |
| Sea Hunter | 10.5 KHz | | UK |
| Sea Searcher | 6 to 9 KHz | | UK |
| AN-SQS 56 | 5.4 KHz | | US |
| AN-SQS 53 | 3.5 KHz | 60000 lb dome | US |

## TOWED ARRAY OR VDS

| Name | Frequency | Weight | Source |
|---|---|---|---|
| SONAC PTA | | | Fin |
| Diodon | 12 KHz | 8 tonnes | France |
| Salmon | 19 KHz | 7630 kg | France |
| ATAS | | 4.7 tonnes (mod) | UK |
| COMTASS | | | UK |
| AN-SQS 35 | 13 KHz | | US |
| AN-SQR 19 | | | US |

## DIPPING SONARS

| | | | |
|---|---|---|---|
| AN-AQS 13 | 9.25-10.75 KHz | 775 lb | US |
| AN-AQS 18 | 9.25-10.75 KHz | 600 lb | US |
| ALFS | | | |

## NEW DEVELOPMENTS

Twin Tails
Bi-static towed arrays
Combined fish and array

## Radar Characteristics

| COUNTRY | DESIG. | Peak Pwr (KW) | Avg. Pwr. (KW) | Freq | Pulse length (microsec) | Gain (dB) | BW horiz (deg) | BW vert (deg) |
|---|---|---|---|---|---|---|---|---|
| Israel | EL/M-2207 | 425 | 425 | 3.1-3.3 GHz | 0.4-1.4 | 28 | 3.3 | 10 |
| US | SPS-49 | 360 | 13 | 850-942 MHz | 125 | 29 | 3.3 | 9 |
| US | SPS-65/ER | 25 | 1.2 | 1.2-1.35 GHz | 7 | 23 | 3 | |
| US | FAST | 1000 | 10 | 5.4-5.9 GHz | 0.6-200 | - | 3 | 9 |
| France | CASTOR II | 30 | 0.12 | 6.2-10.4 GHz | 7.5 | 43 | 0.67 | 1.5 |
| Netherland | SMART | 150 | - | | 0.6 | 31.5 | 2 | 7 |
| - | XPAR | 5000 | 58 | 10 GHz | 5.5 | 40 | 1.5 | 1.5 |
| US | SPY-1D | 5000 | 58 | 3.1-3.5 GHz | var | 42 | 1.7 | 1.7 |

# ANTI-SURFACE MISSLES

| NAME | DESIGNATOR | COUNTRY of Origin | LAUNCH Vehicle | WEIGHT (lbs) | RANGE (Km) | SPEED (Mach) | CRUISE ALT (feet) | ATTACK ALT (feet) | WARHEAD WGT (lbs) | WARHEAD TYPE | GUIDANCE | DIAMETER (ft) | LENGTH (ft) | COST (Dollars) | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Silkworm | | China | ship/shore | 2998 | 95 | 0.9 | | 30-50 | 513 | blast | MPR,IR, | 0.76 | 7.36 | | |
| Flying Dragon | FL-1/SY-1 | | ship/shore | | | | | 30 | 513 | | MPR | | | | |
| Sea Eagle | | | | | | | | | | | | | | | |
| | FL-2 | | ship/shore | 1300 | 50 | 0.9 | | skimmer | 365 | SC | "Anti-Jam" | 0.54 | 6 | | |
| | FL-7 | | ship/shore | 1800 | 32 | 1.4 | 50-100 | | | SC | ECCM features | 0.54 | 6.6 | | |
| | C801/802 | | ship/air | 815 | 80-50 | 0.9 | 20-30 | 5-7 | 165 | SAP | MPR | 0.36 | 5.8 | | |
| Exocet | | France | ship/air/sub | 750 | 42-65 | 0.93 | 9 | 2.5-8 | 165 | Blast/frag | see note 1 | 0.348 | 5.2 | $400,000 | |
| ANS | | | ship/air | 850 | 180 | 2 | high alt | skim/weave | 180 | SAP | | 0.35 | 5.7 | $1,500,000 | |
| | SS 11 | | ship/air/ | 66 | 3.3 | 580 fps | LOS | LOS | 16 | 3.5 # HE blast | Wire Guided | 6.4 in | 47.6 in | $1,900 | obsolete |
| | SS12M | | ship/air/shore | 165 | 6.5 | 580 fps | LOS | LOS | 62.5 # | SAP,several | WG | 7.1 in | 73.7 in | | |
| Gabriel | II | Israel | ship/air/shore | 500 | 40 | 0.65 | | 2.5 | 180 | | optical/CG | 0.35 | 3.35 | $400,000 | |
| | III | | | 560 | 36 | 0.65 | | 1.5 | 150 | | FAAS | 0.34 | 3.85 | $460,000 | |
| | IV | | | 960 | 200 | 0.85 | | | 200 | | | 0.43 | 4.7 | $675,000 | |
| Otomat | I | Italy | ship/ | 770 | 60 | 0.9 | 80 | 175 pop | 210 | blast | Xbnd AS | | | $400,000 | 83 known launch platforms |
| | II | | | | 180 | 0.9 | | skim | | | CG helo/ | | | | |
| Otomach | | | | | 193-380 | 2 | | | 100 | | AS/IR/TV | | | | |
| Sea Killer | | | | 330 | 25 | 1.9 | 5 | 3.4 | 70 | HE frag | beam rider | 0.32 | 4.84 | | |
| Sea Power | SSM-1 | Japan | ship/air | 661 | 150 | 0.9 | | | 225 | | | 0.35 | 5 | $680,000 | Harpoon Copy Cat |
| Penguin | AGM-119 | Norway | Ship/shore | 330 | 40 | 0.8 | 100 | skim | 250 # | SAP | IR | 0.28 | 2.95 | $220,000-<br>$650,000 | |
| | Rb 08A | Sweden | ship/shore | 782 | 75 | 0.65 | | | 250 | blast frag | | 0.65 | 5.7 | | |
| Penguin II | Rb 12 | | | | | | | | | | | | | | |
| | RBS 15 | | ship/air | 598 | 70 | 0.7 | | | 250 | SAP | X,Ku | 0.5 | 4.35 | $479,000 | |
| Styx | SS-N-2 | Russia | Ship/Shore | 2300 | 25 | 0.9 | 400 | 100 | 500 | | I band active | 0.76 | 6.5 | | |
| Sandbox | SS-N-12 | | ship/ | 5000 | 300nm | 2.5 | | | 1000 | HE | | 0.9 | 11.7 | | |
| Sunburn | SS-N-22 | | ship/ | | 68nm | 2.5 | | | 454 | HE | | | 9.15 | | |
| Hellfire | AGM-114A | USA | ship/air/shore | 50 | 3nm | 1+ | | | 9.1 | SC | SAL | 18 | 1.63 | | |
| Tomahawk | TLAM/TASM | | Ship/air/sub | 2640 | 250-700 | 0.75 | 15-100m | 30m | 454 kg | various | Inertial/Tercom | 1.8 | 18.06 | $1,800,000 | |
| Harpoon | AGM-84 | | ship/air | 520 | 80nm | 0.85 | | | 225 | var | var | 34.3 | 4.63 | $300,000 | 40% of production for foreign sales |

**Notes**

| | |
|---|---|
| MPR | Mono Pulse Radar |
| CCP | Course Correcting Projectile |
| SAP | Semi Armor Piercing |
| FAAS | Frequency Agile Active Seeker |
| AP | Armor Piercing |
| SC | shaped Charge |
| SAL | Semi-Active Laser |

## ANTI-AIR MISSLES

| NAME | COUNTRY of Origin | LAUNCHER | WEIGHT (lbs) | RANGE (Km) | SPEED (Mach) | GUIDANCE | DIAMETER (ft) | LENGTH (ft) | Comments |
|---|---|---|---|---|---|---|---|---|---|
| MASCURA | France | twin | 4600 | 30 | 3 | Semi-Active | 1.3 | 28.2 | Need 3D radar reloading semi-auto |
| MISTRAL | | launch tube | 44 | 3.7 | 2.6 | Active | 0.3 | 5.9 | |
| CROTALE | | VLS R&D | 231 | 8 | 2.5 | Semi-Active IR TV | 0.5 | 9.8 | designed to counter air saturation attacks |
| RAM | USA | bolt on several | 1621 | 5.6 | 1.0+ | Passive RF/IR | 0.42 | 9.2 | |
| STINGER | | Shoulder | 22.3 | 3 | 2.2 | Optical IR Homing<br>Passive IR/UV | 0.23 | 5 | |
| SM-2 ER | | VLS/Rail | 2996 | 30+ | 2.5 | Semi-Active | 1.13 | 26.2 | |
| SM-2 MR | | VLS/Rail | 1366 | 10+ | 2.5 | Semi-Active | 1.13 | 14.7 | |
| SEA SPARROW | | VLS R&D/Box | 500 | 12 | 1 | Semi-Active CW RF | 0.67 | 12 | |
| SEA DART | Great Britain | cannister | 1210 | 50 | 3 | Semi-Active | 1.4 | 14.5 | |
| SEA WOLF | | vertical | 1761 | 4 | 2 | Semi-Active | 0.6 | 6.5 | launch and control automatic |
| ASPIDE | Italy | box | 485 | 11 | 2.5 | Semi-Active | 0.7 | 12.1 | good in ECM and clutter |
| GRAIL | Russia | shoulder | 201 | 6 | 1.5 | Active IR | 0.2 | 4.8 | |

## ANTI-SUB MISSLES

| NAME | COUNTRY of Origin | LAUNCHER | WEIGHT (lbs) | RANGE (Km) | SPEED (Mach) | GUIDANCE | DIAMETER (ft) | LENGTH (ft) | Comments |
|---|---|---|---|---|---|---|---|---|---|
| ASROC | USA | MK16,26,10,VL | 957 | 7 | | Active | 1.1 | 15.1 | Anti-Sub |
| IKARA | Austrailia | Rail/tubes | 1400 | 13 | 0.8 | Active | 1 | 11.2 | Anti-Sub |

## Mine Hunting Devices

| Hull Mounted | Manufacturer | Frequencies | Weight | Power Required | Max/Min Depths | Beamwidths | Cost | Notes/Comments |
|---|---|---|---|---|---|---|---|---|
| SH100 | Simrad | 95/335kHz | | | up to 100 m | Search: 45° hor, 1.6° ver Classification: 16° hor, .25° ver | | Retractable, detects 600 m, classify 200 m, can operate search and classification sonars simultaneously, 10° vertical coverage in both modes |
| **Variable Depth/ Towed/Side Scan/ROV** | | | | | | | | |
| RMOP-Dolphin | ISE (UK) / NSWC | 7.3 m long 1 m diameter | 2832 kg | 150 shp | semi-submersible | | | air breathing, diesel powered semi-submersible, connect to ship via LOS UHF data link. 24 hr endurance at 12 kts. Operable in Sea State 5. |
| SEABAT6012 | Reson Systems | 455kHz | 100 lbs | N/A | N/A | Search: 165° hor, 15° ver Classification: 1.5° hor, 15° ver | | Volume search and near surface surveillance sonar mounted on keel of Dolphin. Up to 200 m range. Multiple beams (60), with 20 kHz bandwidth. Operates at speeds up to 12 kts. |
| AN/AQS-14 | Westinghouse | | | | | | | towed array behind RMOP. Used for bottom scanning. 3 m long |
| SQQ-14/30 | Martin Marietta | 80/350 kHz | | | 45 m | Search: 100° hor, 10° ver Classification: 18° hor, 10° ver | | |
| PVDS: Sutec Double Eagle/TSM 2022 Mk3 | Bofors/ Thomson Sintra | 165/400 kHz | 480 kg (including payload | | 300m | Search: 63° hor, 19° ver Classification: 12° hor, 7° ver | | 5 kts, 600 m umbilical |

Small Boat Requirement

| Type | Length | Beam | Max speed | Cargo/Passengers | Max Weight | Range | Engine | Notes |
|---|---|---|---|---|---|---|---|---|
| Surf boat | 26 ft | 8 ft | 16 kts light, 12 loaded | 3500 lbs or 16 passengers | 5000 lbs light | 50 nm @ 10 kts | Diesel | Self righting, self bailing |
| Fast boat | 21-24 ft | 8.5 ft | 30 kts | 1800 lbs or 8 passengers | 4000 lbs light | 25 nm @ max speed, 50 nm @ 10 kts | Diesel | Self bailing, 12" fender minimum (5 kt bumper), stern launchable |

# APPENDIX D

## SONAR CALCULATIONS

## Summary

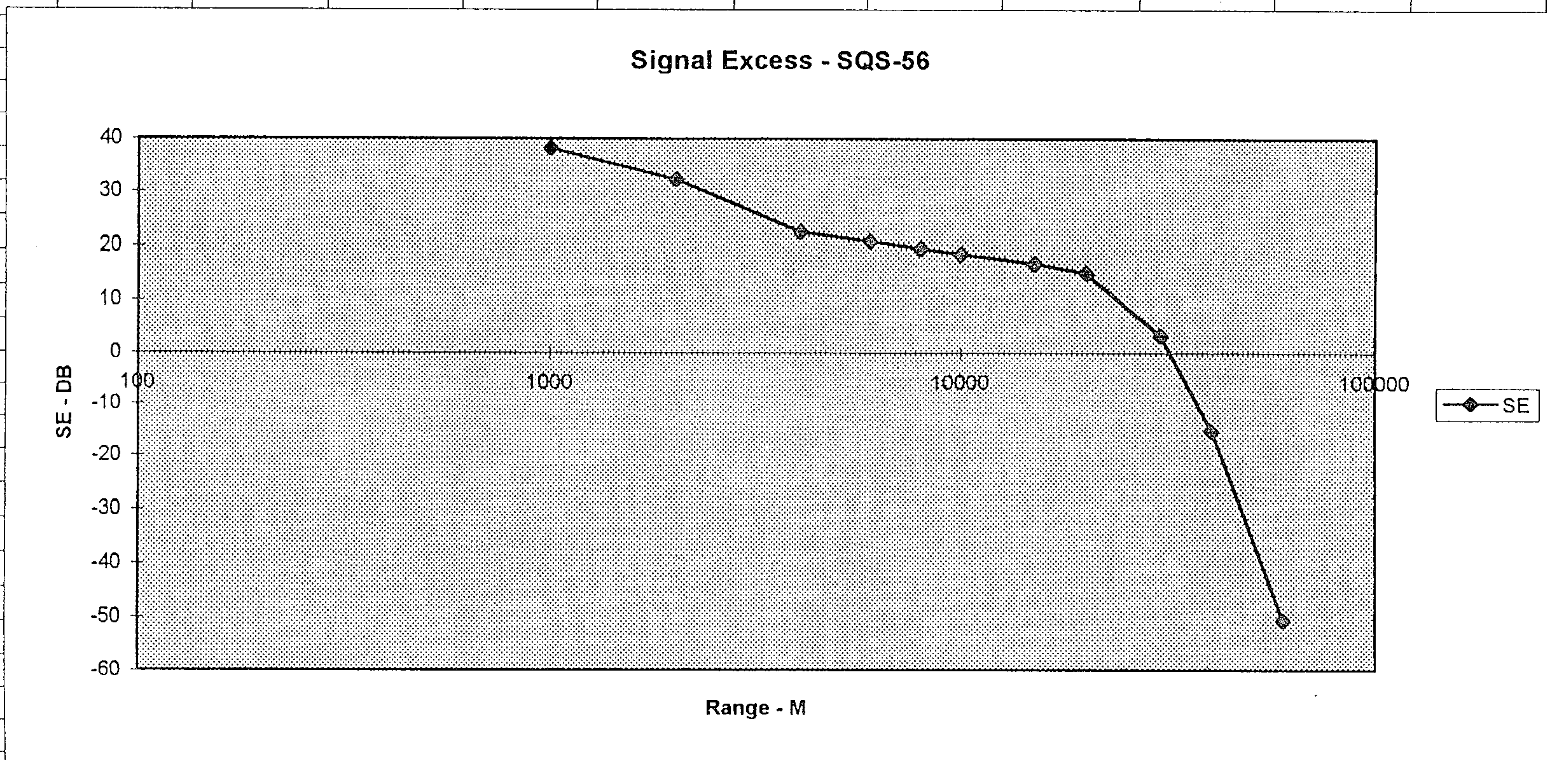
Sonar calculations were completed for two sonar systems, a SQS-56 hull-mounted sonar and a Active Towed Array Sonar (ATAS). Using a Microsoft Excel V5.0 spreadsheet, parameters for frequency, power output, sound speed, depth, and pulse width were used to calculate the detection range for a submarine with a target strength of 15dB, at a depth of 150 meters in water 2000 meters deep. Assumptions included a 50% probability of detection and straight ray path propagation.

Page D-3&4 contains the range calculations for the SQS-56 sonar

Page D-5&6 contains the range calculations for the ATAS

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Active sonar range prediction** | | | | | | | | | | | | |
| **SQS-56 sonar** | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| Constants | | | | | | | | | | | | |
| c= | 1500 | | f= | 7500 | | depth= | 4 | | W= | 125 | | |
| diameter= | 1.2 | | h= | 1.2 | | Power= | 3600 | | | | | |
| DT= | 0 | | alpha= | 0.000704 | | T= | 0.1 | | | | | |
| | | | | | | | | | | | | |
| Calculated parameters | | | | | | | | | | | | |
| BWh= | 9.75205 | | BWv= | 8.468383 | | AG= | 26.98954 | | | | | |
| SLt= | 233.5526 | | DT= | -2.49877 | | | | | | | | |
| | | | | | | | | | | | | |
| Target parameters | | | | | | | | | | | | |
| depth= | 150 | | TS= | 15 | | depth b= | 2000 | | | | | |
| | | | | | | | | | | | | |
| Level Calculations | | | | | | | | | | | | |
| Range | Spreading | Atten | 2TL | PHIt | 2ARt | SLr | Vol | RSv | 2EARv | RLv | | |
| 1000 | 120 | 1.408 | 121.408 | 8.395191 | -1.5 | 125.6446 | 86.74975 | -73 | -22.4279 | 103.4665 | | |
| 2000 | 132.0412 | 2.816 | 134.8572 | 4.186316 | -0.5 | 113.1954 | 92.75301 | -73 | -22.4517 | 95.99668 | | |
| 4000 | 144.0824 | 5.632 | 149.7144 | 2.091761 | 0 | 98.83817 | 95.76331 | -73 | -15.6634 | 90.93809 | | |
| 6000 | 151.1261 | 8.448 | 159.5741 | 1.394335 | 0 | 88.97852 | 97.52422 | -73 | -15.6634 | 82.83935 | | |
| 8000 | 156.1236 | 11.264 | 167.3876 | 1.045706 | 0 | 81.16497 | 98.77361 | -73 | -15.6634 | 76.27519 | | |
| 10000 | 160 | 14.08 | 174.08 | 0.836548 | 0 | 74.47257 | 99.74271 | -73 | -15.6634 | 70.55189 | | |
| 15000 | 167.0437 | 21.12 | 188.1637 | 0.557688 | 0 | 60.38892 | 101.5036 | -73 | -15.6634 | 58.22915 | | |
| 20000 | 172.0412 | 28.16 | 200.2012 | 0.418263 | 0 | 48.35137 | 102.753 | -73 | -15.6634 | 47.44099 | | |
| 30000 | 179.0849 | 42.24 | 221.3249 | 0.278841 | 0 | 27.22772 | 104.5139 | -73 | -15.6634 | 28.07825 | | |
| 40000 | 184.0824 | 56.32 | 240.4024 | 0.20913 | 0 | 8.150167 | 105.7633 | -73 | -15.6634 | 10.25009 | | |
| 60000 | 191.1261 | 84.48 | 275.6061 | 0.13942 | 0 | -27.0535 | 107.5242 | -73 | -15.6634 | -23.1926 | | |

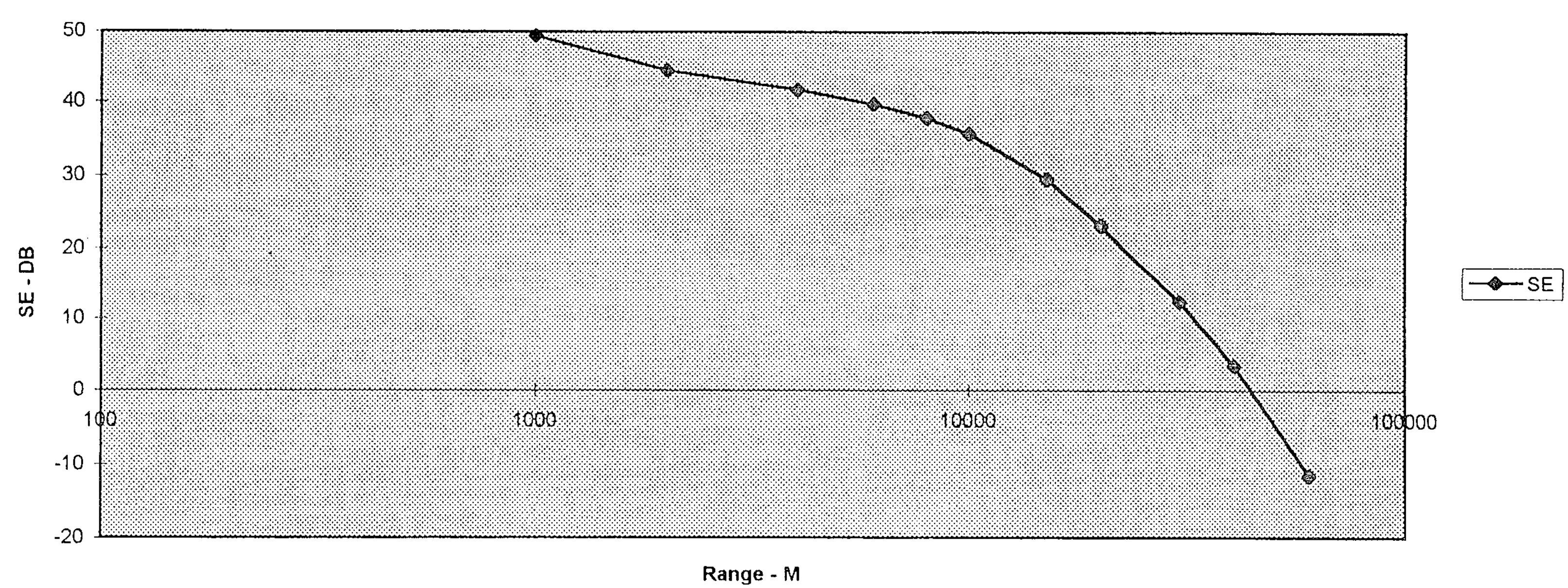
| Range | Area | PHIs | 2EARs | RSs | RLs | PHIb | 2EARb | RSb | RLb | NLr | NL | SE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1000 | 41.06035 | 0.229184 | -15.6721 | -60 | 77.53285 | 0 | | | | 37.97956 | 103.4775 | 38.15536 |
| 2000 | 44.07065 | 0.114592 | -15.6721 | -60 | 67.09395 | 0 | | | | 37.97956 | 96.00227 | 32.18141 |
| 4000 | 47.08095 | 0.057296 | -15.6721 | -60 | 55.24705 | 60.06614 | -45.6721 | -18 | 67.24705 | 37.97956 | 90.93928 | 22.3872 |
| 6000 | 48.84186 | 0.038197 | -15.6721 | -60 | 47.14831 | 70.56929 | -45.6721 | -13 | 64.14831 | 37.97956 | 82.84066 | 20.62617 |
| 8000 | 50.09125 | 0.028648 | -15.6721 | -60 | 40.58415 | 75.55207 | -45.6721 | -11 | 59.58415 | 37.97956 | 76.277 | 19.37628 |
| 10000 | 51.06035 | 0.022918 | -15.6721 | -60 | 34.86085 | 78.48643 | -45.6721 | -10 | 54.86085 | 37.97956 | 70.55546 | 18.40542 |
| 15000 | 52.82126 | 0.015279 | -15.6721 | -60 | 22.53811 | 82.35316 | -45.6721 | -9 | 43.53811 | 37.97956 | 58.27112 | 16.60611 |
| 20000 | 54.07065 | 0.011459 | -15.6721 | -60 | 11.74995 | 84.27235 | -45.6721 | -8 | 33.74995 | 37.97956 | 47.90778 | 14.9319 |
| 30000 | 55.83156 | 0.007639 | -15.6721 | -60 | -7.61279 | 86.1851 | -45.6721 | -8 | 14.38721 | 37.97956 | 38.40266 | 3.313372 |
| 40000 | 57.08095 | 0.00573 | -15.6721 | -60 | -25.441 | 87.13975 | -45.6721 | -9 | -4.44095 | 37.97956 | 37.98688 | -15.3484 |
| 60000 | 58.84186 | 0.00382 | -15.6721 | -60 | -58.8837 | 88.09361 | -45.6721 | -9 | -37.8837 | 37.97956 | 37.97956 | -50.5447 |



| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Active sonar range prediction** | | | | | | | | | | |
| **ATAS sonar** | | | | | | | | | | |
| Constants | | | | | | | | | | |
| c= | 1500 | | f= | 3000 | | depth= | 100 | | W= | 125 |
| diameter= | 0.3 | | h= | 1.2 | | Power= | 2500 | | depth b= | 2000 |
| DT= | 0 | | alpha= | 0.0002 | | T= | 0.1 | | | |
| Calculated parameters | | | | | | | | | | |
| BWh= | 25 | | BWv= | 21.27368 | | AGt= | 18.9217 | | BWhr= | 1.27 |
| SLt= | 223.9011 | | DT= | -2.49877 | | AGr= | 31.17162 | | BWvr= | 25 |
| Target parameters | | | | | | | | | | |
| depth= | 150 | | TS= | 15 | | | | | | |
| Level Calculations | | | | | | | | | | |
| Range | Spreading | Atten | 2TL | PHIt | 2ARt | SLr | Vol | RSv | 2EARv | RLv |
| 1000 | 120 | 0.4 | 120.4 | 2.865984 | -0.5 | 118.0011 | 87.14634 | -73 | -30.0547 | 87.59279 |
| 2000 | 132.0412 | 0.8 | 132.8412 | 1.432544 | 0 | 106.0599 | 92.75301 | -73 | -30.6222 | 80.19074 |
| 4000 | 144.0824 | 1.6 | 145.6824 | 0.716216 | 0 | 93.2187 | 95.76331 | -73 | -30.9603 | 70.0217 |
| 6000 | 151.1261 | 2.4 | 153.5261 | 0.47747 | 0 | 85.37505 | 97.52422 | -73 | -31.0831 | 63.81618 |
| 8000 | 156.1236 | 3.2 | 159.3236 | 0.358101 | 0 | 79.5775 | 98.77361 | -73 | -31.1466 | 59.20452 |
| 10000 | 160 | 4 | 164 | 0.28648 | 0 | 74.9011 | 99.74271 | -73 | -31.1854 | 55.45842 |
| 15000 | 167.0437 | 6 | 173.0437 | 0.190986 | 0 | 65.85745 | 101.5036 | -73 | -31.238 | 48.12309 |
| 20000 | 172.0412 | 8 | 180.0412 | 0.14324 | 0 | 58.8599 | 102.753 | -73 | -31.2647 | 42.34826 |
| 30000 | 179.0849 | 12 | 191.0849 | 0.095493 | 0 | 47.81625 | 104.5139 | -73 | -31.2916 | 33.0386 |
| 40000 | 184.0824 | 16 | 200.0824 | 0.07162 | 0 | 38.8187 | 105.7633 | -73 | -31.3051 | 25.27688 |
| 60000 | 191.1261 | 24 | 215.1261 | 0.047746 | 0 | 23.77505 | 107.5242 | -73 | -31.3188 | 11.98052 |

| Range | Area | PHIs | 2EARs | RSs | RLs | PHIb | 2EARb | RSb | RLb | NLr | NL | SE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1000 | 45.14879 | 5.73917 | -24.525 | -50 | 74.1249 | 0 | | | | 54.0474 | 87.78578 | 49.38571 |
| 2000 | 48.15909 | 2.865984 | -24.525 | -50 | 64.694 | 0 | | | | 54.0474 | 80.32179 | 44.4085 |
| 4000 | 51.16939 | 1.432544 | -24.525 | -50 | 54.8631 | 61.64065 | -54.525 | -18 | 56.8631 | 54.0474 | 70.25734 | 41.63176 |
| 6000 | 52.9303 | 0.954974 | -24.525 | -50 | 48.78036 | 71.53854 | -54.525 | -13 | 55.78036 | 54.0474 | 64.37314 | 39.67231 |
| 8000 | 54.17969 | 0.716216 | -24.525 | -50 | 44.2322 | 76.26096 | -54.525 | -11 | 53.2322 | 54.0474 | 60.46524 | 37.78266 |
| 10000 | 55.14879 | 0.572967 | -24.525 | -50 | 40.5249 | 79.04722 | -54.525 | -10 | 50.5249 | 54.0474 | 57.90047 | 35.67102 |
| 15000 | 56.9097 | 0.381975 | -24.525 | -50 | 33.24216 | 82.72299 | -54.525 | -9 | 44.24216 | 54.0474 | 55.06457 | 29.46328 |
| 20000 | 58.15909 | 0.28648 | -24.525 | -50 | 27.494 | 84.54868 | -54.525 | -8 | 39.494 | 54.0474 | 54.34056 | 23.18974 |
| 30000 | 59.92 | 0.190986 | -24.525 | -50 | 18.21126 | 86.36884 | -54.525 | -8 | 30.21126 | 54.0474 | 54.08282 | 12.40383 |
| 40000 | 61.16939 | 0.14324 | -24.525 | -50 | 10.4631 | 87.27743 | -54.525 | -9 | 21.4631 | 54.0474 | 54.05335 | 3.435745 |
| 60000 | 62.9303 | 0.095493 | -24.525 | -50 | -2.81964 | 88.18533 | -54.525 | -9 | 8.180361 | 54.0474 | 54.04768 | -11.6022 |

**Signal Excess - ATAS**



# APPENDIX E

## RADAR CALCULATIONS

## Summary

Radar calculations were completed on several radars from various countries of origin including: EL/M-2207 (Israel), SPS-49 (US), FAST (US), Castor II (France), SMART (Netherlands), SPY-1D (US), and X-band Phased Array Radar (XPAR). The XPAR is a conceptual radar design utilized by the CPCX design team to achieve high performance radar characteristics combined with the advantage of low weight and reduced volume. XPAR has many of the features and capabilities of a SPY-1D radar, however the XPAR utilizes a X-band operating frequency instead of the SPY's S-band to achieve weight reduction in many system components including: array size, waveguide dimensions and computers.

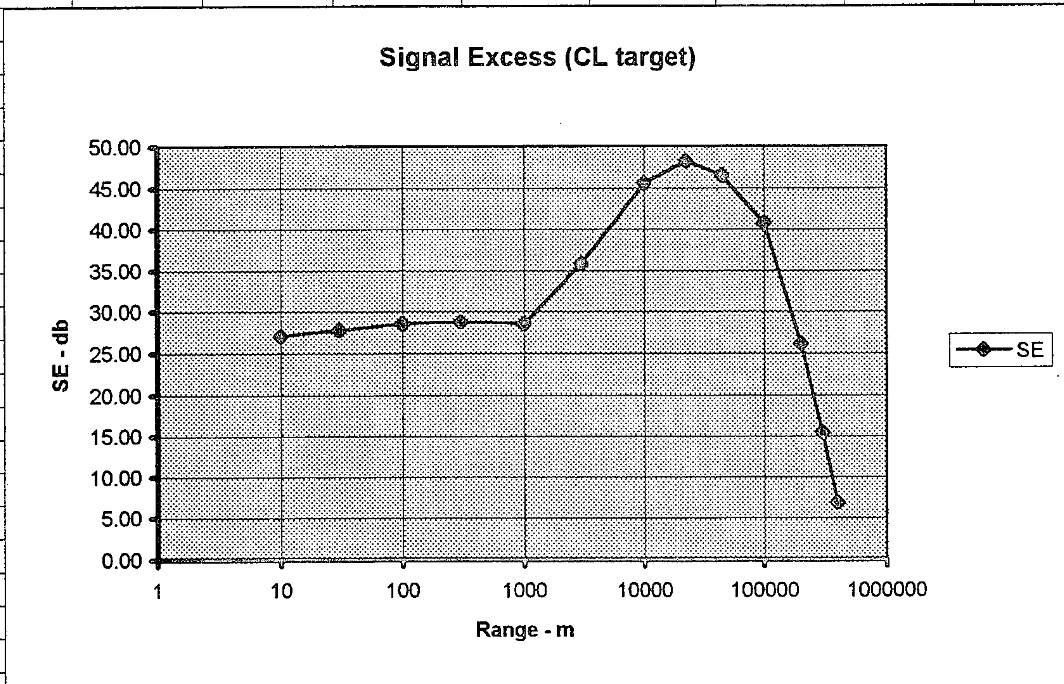
The calculations utilized each radar's specific characteristics including power output, beamwidth, pulse width, and frequency to calculate the signal excess in terms of range. Each threat missile's radar cross section (RCS) was then used with the signal excess vs range plot to determine the maximum detection range. These calculations were performed for each radar against each missile flying either a beam centered or sea skimming attack trajectory. An example of these calculations for the SPY-1D radar is located in tables (E-1) and (E-2) respectively. A summary of all radars and their maximum detection range for each missile is located in table (E-3).

# Table E-1: SPY-1D Radar Calculation, Beam Centerline Target

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Constants | | | | | | | | |
| h= | 20 | | c= | 3E+08 | | TS= | 0 | |
| d= | 3.75 | | DT= | -1.53 | | t= | 2.17E-03 | |
| Pt= | 5.00E+06 | | Pavg= | 3230.77 | | | | |
| | | | | | | | | |
| Parameters | | | | | | | | |
| T= | 1.40E-06 | | f= | 3.30E+09 | | alpha= | 8.00E-06 | |
| BWh= | 1.70 | | Lv= | 2.71 | | Phi(cl)= | 10 | |
| Lh= | 2.71 | | BWv= | 1.70 | | AG= | 38.54 | |
| rpm(max) | 130.77 | | rpm= | 60 | | Pulses/look= | | 2.18 |
| | | | | | | | | |
| **Noise Level** | | | | | | | | |
| NL(amb) | -148.00 | | NL(int) | -132.46 | | NL(tot)= | -132.34 | |
| | | | | | | | | |
| **Source Level** | | | | | | | | |
| Slt= | 94.52561 | | | | | | | |
| Range | SLt | 2*AR | 2*TL | TS | SLr | DT | SLr* | |
| 10 | 94.53 | -1 | -40.00 | 0 | 53.53 | -1.53 | 55.06 | |
| 30 | 94.53 | -1 | -59.09 | 0 | 34.44 | -1.53 | 35.97 | |
| 100 | 94.53 | -1 | -80.00 | 0 | 13.52 | -1.53 | 15.05 | |
| 300 | 94.53 | -1 | -99.09 | 0 | -5.56 | -1.53 | -4.03 | |
| 1000 | 94.53 | -1 | -120.02 | 0 | -26.49 | -1.53 | -24.96 | |
| 3000 | 94.53 | -1 | -139.13 | 0 | -45.61 | -1.53 | -44.08 | |
| 10000 | 94.53 | -1 | -160.16 | 0 | -66.63 | -1.53 | -65.10 | |
| 22583.18 | 94.53 | -1 | -174.51 | 0 | -80.99 | -1.53 | -79.46 | |
| 45166.36 | 94.53 | -1 | -180.92 | 0 | -87.39 | -1.53 | -85.86 | |
| 100000 | 94.53 | -1 | -186.60 | 0 | -93.07 | -1.53 | -91.54 | |
| 200000 | 94.53 | -1 | -201.24 | 0 | -107.72 | -1.53 | -106.19 | |
| 300000 | 94.53 | -1 | -211.88 | 0 | -118.36 | -1.53 | -116.83 | |
| 400000 | 94.53 | -1 | -220.48 | 0 | -126.96 | -1.53 | -125.43 | |
| | | | | | | | | |
| **Reverberation Level** | | | rmax= | 22583.18 | | | | |
| | | | | | | | | |
| Range | SLt | 2*TL | Area | Phi | RSs | EAR | 2*AR | RLs |
| 30 | 94.53 | -59.09 | 45.98 | -90.00 | -15 | -23.26 | -35 | 8.16 |
| 100 | 94.53 | -80.00 | 51.20 | -17.46 | -48 | -23.26 | -8 | -13.53 |
| 300 | 94.53 | -99.09 | 55.98 | -5.74 | -57 | -23.26 | -4 | -32.85 |
| 1000 | 94.53 | -120.02 | 61.20 | -1.72 | -64 | -23.26 | -2 | -53.54 |
| 3000 | 94.53 | -139.13 | 65.98 | -0.57 | -77 | -23.26 | -1 | -79.89 |
| 10000 | 94.53 | -160.16 | 71.20 | -0.17 | -92 | -23.26 | -1 | -110.69 |
| 22583.18 | 94.53 | -174.51 | 74.74 | -0.08 | -100 | -23.26 | -1 | -129.50 |
| | | | | | | | | |
| | | | | | | | | |

## Table E-1: SPY-1D Radar Calculation, Beam Centerline Target

| Signal Excess | | | | | |
|---|---|---|---|---|---|
| Range | RLs | NL(tot) | NL+RLs | SLr* | SE |
| 10 | 28.00 | -132.34 | 28.00 | 55.06 | 27.06 |
| 30 | 8.16 | -132.34 | 8.16 | 35.97 | 27.81 |
| 100 | -13.53 | -132.34 | -13.53 | 15.05 | 28.58 |
| 300 | -32.85 | -132.34 | -32.85 | -4.03 | 28.81 |
| 1000 | -53.54 | -132.34 | -53.54 | -24.96 | 28.58 |
| 3000 | -79.89 | -132.34 | -79.89 | -44.08 | 35.81 |
| 10000 | -110.69 | -132.34 | -110.66 | -65.10 | 45.55 |
| 22583.18 | -129.50 | -132.34 | -127.68 | -79.46 | 48.23 |
| 45166.36 | | -132.34 | -132.34 | -85.86 | 46.48 |
| 100000 | | -132.34 | -132.34 | -91.54 | 40.80 |
| 200000 | | -132.34 | -132.34 | -106.19 | 26.16 |
| 300000 | | -132.34 | -132.34 | -116.83 | 15.51 |
| 400000 | | -132.34 | -132.34 | -125.43 | 6.91 |

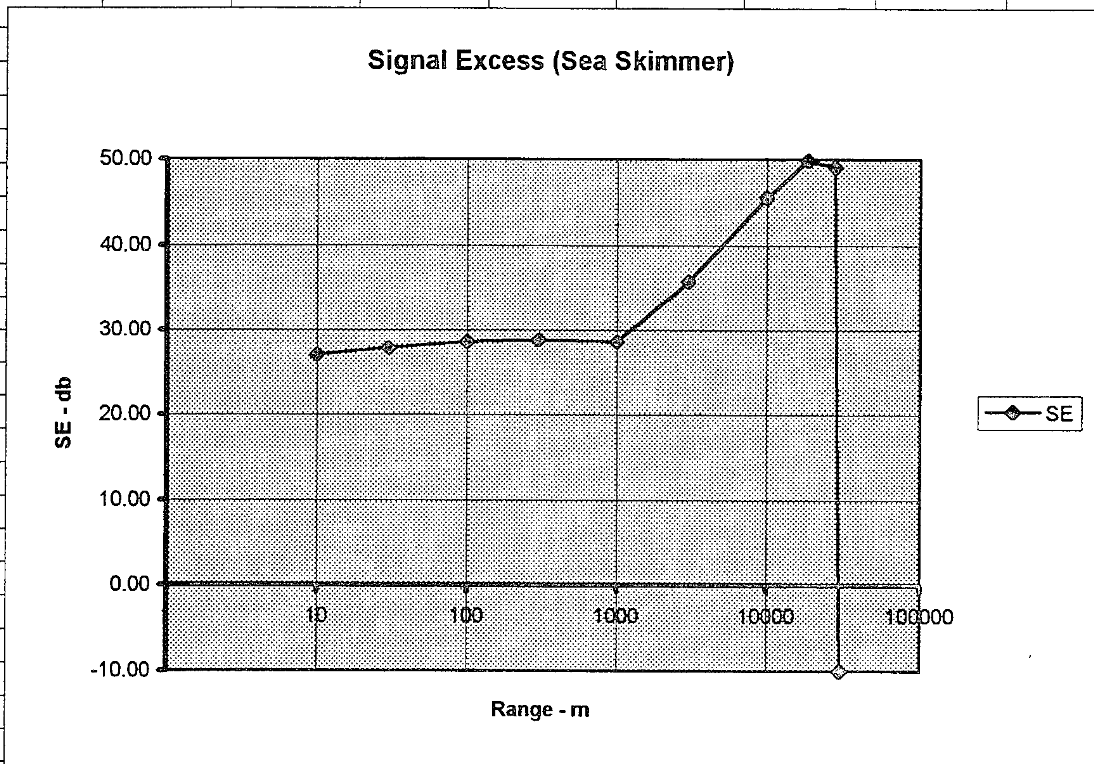


## Table E-2: SPY-1D Radar Calculation, Sea Skimming Target

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Constants | | | | | | | | |
| h= | 20 | | c= | 3E+08 | | TS= | 0 | |
| d= | 3.75 | | DT= | -1.53 | | t= | 2.17E-03 | |
| Pt= | 5.00E+06 | | Pavg= | 3230.77 | | | | |
| | | | | | | | | |
| Parameters | | | | | | | | |
| T= | 1.40E-06 | | f= | 3.30E+09 | | alpha= | 8.00E-06 | |
| BWh= | 1.7 | | Lv= | 2.71 | | Phi(cl)= | 10 | |
| Lh= | 2.71 | | BWv= | 1.70 | | AG= | 38.54 | |
| rpm(max) | 130.77 | | rpm= | 60 | | Pulses/look= | | 2.18 |
| | | | | | | | | |
| **Noise Level** | | | | | | | | |
| NL(amb) | -148.00 | | NL(int) | -132.46 | | NL(tot)= | -132.34 | |
| | | | | | | | | |
| **Source Level** | | | | | | | | |
| Slt= | 94.52561 | | | | | | | |
| Range | SLt | 2*AR | 2*TL | TS | SLr | DT | SLr* | |
| 10 | 94.53 | -1 | -40.00 | 0 | 53.53 | -1.53 | 55.06 | |
| 30 | 94.53 | -1 | -59.09 | 0 | 34.44 | -1.53 | 35.97 | |
| 100 | 94.53 | -1 | -80.00 | 0 | 13.52 | -1.53 | 15.05 | |
| 300 | 94.53 | -1 | -99.09 | 0 | -5.56 | -1.53 | -4.03 | |
| 1000 | 94.53 | -1 | -120.02 | 0 | -26.49 | -1.53 | -24.96 | |
| 3000 | 94.53 | -1 | -139.13 | 0 | -45.61 | -1.53 | -44.08 | |
| 10000 | 94.53 | -1 | -160.16 | 0 | -66.63 | -1.53 | -65.10 | |
| 18439.09 | 94.53 | -1 | -170.92 | 0 | -77.40 | -1.53 | -75.87 | |
| 36878.18 | 94.53 | -1 | -178.26 | 0 | -84.74 | -1.53 | -83.21 | |
| | | | | | | | | |
| **Reverberation Level** | | | rmax= | 18439.09 | tarh= | 5 | range= | 9219.544 |
| | | | | | | | | |
| Range | SLt | 2*TL | Area | Phi | RSs | EAR | 2*AR | RLs |
| 30 | 94.53 | -59.09 | 45.98 | -90 | -15 | -23.26 | -35 | 8.16 |
| 100 | 94.53 | -80.00 | 51.20 | -17.4576 | -48 | -23.26 | -8 | -13.53 |
| 300 | 94.53 | -99.09 | 55.98 | -5.73917 | -57 | -23.26 | -4 | -32.85 |
| 1000 | 94.53 | -120.02 | 61.20 | -1.71913 | -64 | -23.26 | -2 | -53.54 |
| 3000 | 94.53 | -139.13 | 65.98 | -0.57297 | -77 | -23.26 | -1 | -79.89 |
| 10000 | 94.53 | -160.16 | 71.20 | -0.17189 | -92 | -23.26 | -1 | -110.69 |
| 18439.09 | 94.53 | -170.92 | 73.86 | -0.09322 | -100 | -23.26 | -1 | -126.80 |
| | | | | | | | | |
| | | | | | | | | |

## Table E-2: SPY-1D Radar Calculation, Sea Skimming Target

| Signal Excess | | | | | | |
|---|---|---|---|---|---|---|
| Range | RLs | NL(tot) | NL+RLs | SLr* | SE | |
| 10 | 28.00 | -132.34 | 28.00 | 55.06 | 27.06 | |
| 30 | 8.16 | -132.34 | 8.16 | 35.97 | 27.81 | |
| 100 | -13.53 | -132.34 | -13.53 | 15.05 | 28.58 | |
| 300 | -32.85 | -132.34 | -32.85 | -4.03 | 28.81 | |
| 1000 | -53.54 | -132.34 | -53.54 | -24.96 | 28.58 | |
| 3000 | -79.89 | -132.34 | -79.89 | -44.08 | 35.81 | |
| 10000 | -110.69 | -132.34 | -110.66 | -65.10 | 45.55 | |
| 18439.09 | -126.80 | -132.34 | -125.73 | -75.87 | 49.86 | |
| 27658.63 | | -132.34 | -132.34 | -83.21 | 49.14 | |
| 30000 | | | | | -10 | (Target not visible) |



# Radar Summary Chart*

CL is a beam centered target
SS is a sea skimming target

| | A-1 (-40) | | A-2 (-40) | | A-3 (-30) | | A-4 (-20) | | M-1 (-45) | | M-2 (-40) | | weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CL | SS** | CL | SS | CL | SS | CL | SS | CL | SS | CL | SS | |
| EL/M-2207 (Israel) | **20** | - | **20** | **5-15** | **37** | **30** | **65** | **30** | - | - | **20** | **5-15** | **ant=245** |
| SPS-49 (US) | **60** | - | **60** | - | **107** | **2-30** | **180** | **1-30** | **50** | - | **60** | - | **1425 above deck 6325 below deck** |
| SPS-65/ER (US) | - | - | - | - | **28** | **5-30** | **50** | **3-30** | - | - | - | - | - |
| FAST (S band) (US) | **75** | - | **75** | **5-15** | **120** | **1-30** | **200** | **3-30** | **60** | - | **75** | **5-15** | **antenna=3182 total=9227** |
| Castor II (France) | **30** | - | **30** | **10-30** | **55** | **5-30** | **95** | **3-30** | **23** | **15-30** | **30** | **10-30** | **antenna=620** |
| SMART (Netherlands) | - | - | - | **4-25** | **25** | **30** | **45** | **30** | - | **7-20** | - | **4-25** | **antenna=1200** |
| XPAR | **85** | - | **85** | **15-30** | **140** | **4-30** | **230** | **15-30** | **65** | - | **85** | **15-30** | **est. 25000** |
| SPY-1D (US) | **110** | - | **110** | **3-30** | **180** | **2-30** | **260** | **30** | **80** | **10-30** | **110** | **3-30** | **antenna=7400 36000 below deck** |

* All ranges in Km
** Missile A-1 is not sea skimming

**Table E-3: Radar Summary**

# APPENDIX F

## FUNCTIONAL ALLOCATION TABLES

## SUMMARY

Functional allocation tables were constructed for each whole ship option to ensure all operational requirements were satisfied and all functions within the detect, control, engage sequence were performed by at least one element in the Combat System suite. The Functional Allocation tables depicted in this appendix are listed below:

| Elements | AAW | | | | | | ASW | | | | ASUW | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Navy Option 1 | Vol Search | ESM | IR | Visual | Organic | Inorganic | Active | Passive | Organic | Inorganic | Surf Search | ESM | IR | Visual | Organic | Inorganic |
| SPY-1D | X | | | | | | | | | | X | | | | | |
| SPS-67 | X | | | | | | | | | | X | | | | | |
| TAS | X | | | | | | | | | | X | | | | | |
| SQR-19 | | | | | | | | X | | | | | | | | |
| SQS-56 | | | | | | | X | X | | | | X | | | | |
| SH-100 | | | | | | | | | | | | | | | | |
| SLQ-32 | | X | | | | | | | | | | X | | | | |
| VIDEO/OPTICAL | | | | X | | | | | | | | | | X | | |
| ACDS | | | | | | | | | | | | | | | | |
| CEC | | | | | | | | | | | | | | | | |
| JMICS | | | | | | | | | | | | | | | | |
| LAMPS | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| SMALL BOATS | | | | | | | | | | | | | | X | X | |
| IFF | | | | | | | | | | | | | | | | |
| MK 99 | | | | | | | | | | | | | | | | |
| - SPG-62 | | | | | | | | | | | | | | | | |
| Mk 34 GFCS | | | | | | | | | | | | | | | | |
| - SPG-60/SPQ-9 | X | | | | | | | | | | X | | | | | |
| IR Mk-46 | | | X | | | | | | | | | | X | | | |
| SQQ-89 | | | | | | | | | | | | | | | | |
| - Mk-309 ASWFC | | | | | | | | | | | | | | | | |
| VOICE COMMS | | | | | | | | | | | | | | | | |
| GPS | | | | | | | | | | | | | | | | |
| TACAN | | | | | | | | | | | | | | | | |
| RING INFORMATION NET. | | | | | | | | | | | | | | | | |
| WCS | | | | | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | | | | | |
| 155 mm GUN | | | | | | | | | | | | | | | | |
| CIWS (2) | | | | | | | | | | | | | | | | |
| Mk 49 (RAM LNCHR) | | | | | | | | | | | | | | | | |
| - RAM | | | | | | | | | | | | | | | | |
| VLS | | | | | | | | | | | | | | | | |
| - HARPOON | | | | | | | | | | | | | | | | |
| - TOMAHAWK | | | | | | | | | | | | | | | | |
| - ESS | | | | | | | | | | | | | | | | |
| - SM-2 MR | | | | | | | | | | | | | | | | |
| - VLA | | | | | | | | | | | | | | | | |
| SVTT | | | | | | | | | | | | | | | | |
| - MK 50 | | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| Oper. Requirements | | | | | | | | | | | | | | | | |
| A1 | | | | | | | | | | | | | | | | |
| A2 | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| A3 | | | | | | | | | | | | | | | | |
| A4 | | | | | | | | | | | X | X | X | X | X | |
| A5 | | | | | X | | | | X | | | | | | X | |
| A6 | | | | | X | | | | X | | | | | | X | |
| A7 | | | | | | | | | | | | | | | | |
| A8 | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| A9 | | | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| B1 | | | | | | | | | | | | | | | | |
| B2 | | | | | | | | | | | | | | | | |
| B3 | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| B4 | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| B5 | X | X | X | X | X | | | | | | | | | | | |
| B6 | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| B7 | | | | | | | | | | | | | | | | |

| Elements | MIW | | | STW | | AMW | | | ELT | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Navy Option 1 | Ship Board | Organic | Inorganic | Organic | Inorganic | Visual | Organic | Inorganic | Vol. Search | Surf Search | ESM | IR | Visual | Organic | Inorganic |
| SPY-1D | | | | | | | | | X | X | | | | | |
| SPS-67 | | | | | | | | | X | X | | | | | |
| TAS | | | | | | | | | X | X | | | | | |
| SQR-19 | | | | | | | | | | | | | | | |
| SQS-56 | X | | | | | | | | | | | | | | |
| SH-100 | X | | | | | | | | | | | | | | |
| SLQ-32 | | | | | | | | | | | X | | | | |
| VIDEO/OPTICAL | | | | | | X | | | | | | | X | | |
| ACDS | | | | | | | | | | | | | | | |
| CEC | | | | | | | | | | | | | | | |
| JMICS | | | | | | | | | | | | | | | |
| LAMPS | | X | | X | | X | X | | X | X | X | X | X | X | |
| SMALL BOATS | | X | | X | | X | X | | | | | | X | X | |
| IFF | | | | | | | | | | | | | | | |
| MK 99 | | | | | | | | | | | | | | | |
| - SPG-62 | | | | | | | | | | | | | | | |
| Mk 34 GFCS | | | | | | | | | | | | | | | |
| - SPG-60/SPQ-9 | | | | | | | | | X | X | | | | | |
| IR Mk-46 | | | | | | | | | | | | X | | | |
| SQQ-89 | | | | | | | | | | | | | | | |
| - Mk-309 ASWFC | | | | | | | | | | | | | | | |
| VOICE COMMS | | | | | | | | | | | | | | | |
| GPS | | | | | | | | | | | | | | | |
| TACAN | | | | | | | | | | | | | | | |
| RING INFORMATION NET. | | | | | | | | | | | | | | | |
| WCS | | | | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | | | | |
| 155 mm GUN | | | | | | | | | | | | | | | |
| CIWS (2) | | | | | | | | | | | | | | | |
| Mk 49 (RAM LNCHR) | | | | | | | | | | | | | | | |
| - RAM | | | | | | | | | | | | | | | |
| VLS | | | | | | | | | | | | | | | |
| - HARPOON | | | | | | | | | | | | | | | |
| - TOMAHAWK | | | | | | | | | | | | | | | |
| - ESS | | | | | | | | | | | | | | | |
| - SM-2 MR | | | | | | | | | | | | | | | |
| - VLA | | | | | | | | | | | | | | | |
| SVTT | | | | | | | | | | | | | | | |
| - MK 50 | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | |
| EOD TEAM | | X | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| Oper. Requirements | | | | | | | | | | | | | | | |
| A1 | | | | | | | | | | | | | | | |
| A2 | | | | | | | | | X | X | X | X | X | X | |
| A3 | | | | | | | | | | | | | | | |
| A4 | | | | | | | | | X | X | X | X | X | X | |
| A5 | | | | X | | | X | | | | | | | X | |
| A6 | | | | X | | | X | | | | | | | X | |
| A7 | | | | | | | | | | | | | | | |
| A8 | X | | | | | | | | X | X | X | X | X | X | |
| A9 | | | | | | | | | | | | | | | |
| A10 | X | X | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| B1 | | | | X | | | | | | | | | | | |
| B2 | | | | | | X | X | | | | | | | | |
| B3 | | | | | | | | | | | | | | | |
| B4 | | | | | | | | | | | | | | | |
| B5 | | | | | | | | | | | | | | | |
| B6 | | | | | | | | | | | | | | | |
| B7 | X | X | | | | | | | | | | | | | |

| Elements | SAR | | | | | | | OTW | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Navy Option 1 | Vol. Search | Surf Search | ESM | IR | Visual | Organic | Inorganic | Vol. Search | Surf Search | ESM | IR | Visual | Organic | Inorganic |
| SPY-1D | X | X | | | | | | X | X | | | | | |
| SPS-67 | X | X | | | | | | X | X | | | | | |
| TAS | X | X | | | | | | X | X | | | | | |
| SQR-19 | | | | | | | | | | | | | | |
| SQS-56 | | | | | | | | | | | | | | |
| SH-100 | | | | | | | | | | | | | | |
| SLQ-32 | | | X | | | | | | | X | | | | |
| VIDEO/OPTICAL | | | | | X | | | | | | | X | | |
| ACDS | | | | | | | | | | | | | | |
| CEC | | | | | | | | | | | | | | |
| JMICS | | | | | | | | | | | | | | |
| LAMPS | X | X | X | X | X | X | | X | X | X | X | X | X | |
| SMALL BOATS | | | | | X | X | | | | | | X | X | |
| IFF | | | | | | | | | | | | | | |
| MK 99 | | | | | | | | | | | | | | |
| - SPG-62 | | | | | | | | | | | | | | |
| Mk 34 GFCS | | | | | | | | | | | | | | |
| - SPG-60/SPQ-9 | X | X | | | | | | X | X | | | | | |
| IR Mk-46 | | | | X | | | | | | | X | | | |
| SQQ-89 | | | | | | | | | | | | | | |
| - Mk-309 ASWFC | | | | | | | | | | | | | | |
| VOICE COMMS | | | | | | | | | | | | | | |
| GPS | | | | | | | | | | | | | | |
| TACAN | | | | | | | | | | | | | | |
| RING INFORMATION NET. | | | | | | | | | | | | | | |
| WCS | | | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | | | |
| 155 mm GUN | | | | | | | | | | | | | | |
| CIWS (2) | | | | | | | | | | | | | | |
| Mk 49 (RAM LNCHR) | | | | | | | | | | | | | | |
| - RAM | | | | | | | | | | | | | | |
| VLS | | | | | | | | | | | | | | |
| - HARPOON | | | | | | | | | | | | | | |
| - TOMAHAWK | | | | | | | | | | | | | | |
| - ESS | | | | | | | | | | | | | | |
| - SM-2 MR | | | | | | | | | | | | | | |
| - VLA | | | | | | | | | | | | | | |
| SVTT | | | | | | | | | | | | | | |
| - MK 50 | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| Oper. Requirements | | | | | | | | | | | | | | |
| A1 | | | | | | | | | | | | | | |
| A2 | X | X | X | X | X | X | | X | X | X | X | X | X | |
| A3 | | | | | | | | | | | | | | |
| A4 | | | | | | | | | | | | | | |
| A5 | | | | | | X | | | | | | | X | |
| A6 | | | | | | X | | | | | | | X | |
| A7 | X | X | X | X | X | X | | X | X | X | X | X | X | |
| A8 | X | X | X | X | X | X | | X | X | X | X | X | X | |
| A9 | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| B1 | | | | | | | | | | | | | | |
| B2 | | | | | | | | | | | | | | |
| B3 | | | | | | | | | | | | | | |
| B4 | | | | | | | | | | | | | | |
| B5 | | | | | | | | | | | | | | |
| B6 | | | | | | | | | | | | | | |
| B7 | | | | | | | | | | | | | | |

**Table F-1: Functional Allocation - Detection (Navy option 1)**

| Elements | AAW | | | | | | | | ASW | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Navy Option 1 | Voice Comm | Display | Identify | Threat Eval. | Track | Correlate | Weapons Assgn. | Command | Voice Comm | Display | Identify | Threat Eval. | Track | Correlate | Weapons Assgn. | Command |
| SPY-1D | | | | | | | | | | | | | | | | |
| SPS-67 | | | | | | | | | | | | | | | | |
| TAS | | | | | | | | | | | | | | | | |
| SQR-19 | | | | | | | | | | | X | X | X | X | | |
| SQS-56 | | | | | | | | | | X | X | X | X | X | | |
| SH-100 | | | | | | | | | | X | X | X | X | X | | |
| SLQ-32 | | X | X | X | | | X | | | | | | | | | |
| VIDEO/OPTICAL | | X | X | X | | X | | | | | | | | | | |
| ACDS | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X |
| CEC | | | | X | X | X | X | X | | | | | | | | |
| JMICS | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X |
| LAMPS | | | X | X | X | X | | | | | X | X | X | X | | |
| SMALL BOATS | | | | | | | | | | | | | | | | |
| IFF | | | X | X | | X | | | | | | | | | | |
| MK 99 | | | | | X | X | X | | | | | | | | | |
| - SPG-62 | | | | | | | | | | | | | | | | |
| Mk 34 GFCS | | X | | | X | X | X | | | | | | | | | |
| - SPG-60/SPQ-9 | | X | | X | X | | X | | | | | | | | | |
| IR Mk-46 | | X | X | X | | | | | | | | | | | | |
| SQQ-89 | | | | | | | | | | X | | X | X | X | X | |
| - Mk-309 ASWFC | | | | | | | | | | X | | X | X | X | X | |
| VOICE COMMS | X | | | | | | X | X | X | | | | | | X | X |
| GPS | | | | | | | | X | | | | | | | | X |
| TACAN | | | | | | | | X | | | | | | | | X |
| RING INFORMATION NET. | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X |
| WCS | | | | | | | X | X | | | | | | | X | X |
| ISDS | | | | | | X | X | X | | | | | | | | |
| 155 mm GUN | | | | | | | | | | | | | | | | |
| CIWS (2) | | | | X | X | X | X | X | | | | | | | | |
| Mk 49 (RAM LNCHR) | | | | | | | | | | | | | | | | |
| - RAM | | | | | | | | | | | | | | | | |
| VLS | | | | | | | | | | | | | | | | |
| - HARPOON | | | | | | | | | | | | | | | | |
| - TOMAHAWK | | | | | | | | | | | | | | | | |
| - ESS | | | | | | | | | | | | | | | | |
| - SM-2 MR | | | | | | | | | | | | | | | | |
| - VLA | | | | | | | | | | | | | | | | |
| SVTT | | | | | | | | | | | | | | | | |
| - MK 50 | | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | | | |
| Oper. Requirements | | | | | | | | | | | | | | | | |
| A1 | X | X | | | | | | | X | X | | | | | | |
| A2 | | | | | | | | | | | | | | | | |
| A3 | X | | | | | | | | X | | | | | | | |
| A4 | | | | | | | | | | | | | | | | |
| A5 | | | | | | | | | | | | | | | | |
| A6 | | | | | | | | | | | | | | | | |
| A7 | | | | | | | | | | | | | | | | |
| A8 | | | | | | | | | | | | | | | | |
| A9 | | | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | | |
| B1 | | | | | | | | | | | | | | | | |
| B2 | | | | | | | | | | | | | | | | |
| B3 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| B4 | | | | | | | | | | | | | | | | |
| B5 | X | X | X | X | X | X | X | X | | | | | | | | |
| B6 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| B7 | | | | | | | | | | | | | | | | |

| Elements | ASUW | | | | | | | | MIW | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Navy Option 1 | Voice Comm | Display | Identify | Threat Eval. | Track | Correlate | Weapons Assgn. | Command | Voice Comms | Display | Identify | Threat Eval. | Track | Correlate | Command |
| SPY-1D | | | | | | | | | | | | | | | |
| SPS-67 | | | | | | | | | | | | | | | |
| TAS | | | | | | | | | | | | | | | |
| SQR-19 | | | | | | | | | | | | | | | |
| SQS-56 | | | | | X | X | | | | | | | | | |
| SH-100 | | | | | | | | | | X | X | X | X | X | |
| SLQ-32 | | X | X | X | | | | | | | | | | | |
| VIDEO/OPTICAL | | X | X | X | | X | | | | | | | | | |
| ACDS | | X | X | X | X | X | X | X | | X | X | X | X | X | X |
| CEC | | | | | | | | | | | | | | | |
| JMICS | | X | X | X | X | X | X | X | | X | X | X | X | X | X |
| LAMPS | | | X | X | X | X | | | | | X | X | X | X | |
| SMALL BOATS | | | X | X | X | X | | | | | X | X | X | X | |
| IFF | | | X | X | | X | | | | | | | | | |
| MK 99 | | | | | | | | | | | | | | | |
| - SPG-62 | | | | | | | | | | | | | | | |
| Mk 34 GFCS | | X | | | X | X | X | | | | | | | | |
| - SPG-60/SPQ-9 | | X | | X | X | | X | | | | | | | | |
| IR Mk-46 | | X | X | X | | | | | | | | | | | |
| SQQ-89 | | | | | | | | | | | | | | | |
| - Mk-309 ASWFC | | | | | | | | | | | | | | | |
| VOICE COMMS | X | | | | | | X | X | X | | | | | | |
| GPS | | | | | | | | X | | | | | | | |
| TACAN | | | | | | | | X | | | | | | | X |
| RING INFORMATION NET. | | X | X | X | X | X | X | X | | X | X | X | X | X | X |
| WCS | | | | | | | X | X | | | | | | | X |
| ISDS | | | | | | | | | | | | | | | |
| 155 mm GUN | | | | | | | | | | | | | | | |
| CIWS (2) | | | | | | | | | | | | | | | |
| Mk 49 (RAM LNCHR) | | | | | | | | | | | | | | | |
| - RAM | | | | | | | | | | | | | | | |
| VLS | | | | | | | | | | | | | | | |
| - HARPOON | | | | | | | | | | | | | | | |
| - TOMAHAWK | | | | | | | | | | | | | | | |
| - ESS | | | | | | | | | | | | | | | |
| - SM-2 MR | | | | | | | | | | | | | | | |
| - VLA | | | | | | | | | | | | | | | |
| SVTT | | | | | | | | | | | | | | | |
| - MK 50 | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | | |
| Oper. Requirements | | | | | | | | | | | | | | | |
| A1 | X | X | | | | | | | X | X | | | | | |
| A2 | | | | | | | | | | | | | | | |
| A3 | X | | | | | | | | X | | | | | | |
| A4 | X | X | X | X | X | X | X | X | | | | | | | |
| A5 | | | | | | | | | | | | | | | |
| A6 | | | | | | | | | | | | | | | |
| A7 | | | | | | | | | | | | | | | |
| A8 | | | | | | | | | | | | | | | |
| A9 | | | | | | | | | | | | | | | |
| A10 | | | | | | | | | X | X | X | X | X | X | X |
| A11 | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | |
| B1 | | | | | | | | | | | | | | | |
| B2 | | | | | | | | | | | | | | | |
| B3 | X | X | X | X | X | X | X | X | | | | | | | |
| B4 | | | | | | | | | | | | | | | |
| B5 | | | | | | | | | | | | | | | |
| B6 | X | X | X | X | X | X | X | X | | | | | | | |
| B7 | | | | | | | | | X | X | X | X | X | X | X |

| Elements | STW | | | | AMW | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Navy Option 1 | Voice Comms | Display | Identify | Command | Voice Comms | Display | Identify | Threat Eval. | Track | Correlate | Weapons Assgn. | Command |
| SPY-1D | | | | | | | | | | | | |
| SPS-67 | | | | | | | | | | | | |
| TAS | | | | | | | | | | | | |
| SQR-19 | | | | | | | | | | | | |
| SQS-56 | | | | | | | | | | | | |
| SH-100 | | | | | | | | | | | | |
| SLQ-32 | | X | X | | | X | X | X | | | | |
| VIDEO/OPTICAL | | X | X | | | X | X | X | | X | | |
| ACDS | | X | X | X | | X | X | X | X | X | X | X |
| CEC | | | | | | | | | | | | |
| JMICS | | X | X | X | | X | X | X | X | X | X | X |
| LAMPS | | | | | | | X | X | X | X | | |
| SMALL BOATS | | | | | | | X | X | X | X | | |
| IFF | | | | | | | | | | | | |
| MK 99 | | | | | | | | | | | | |
| - SPG-62 | | | | | | | | | | | | |
| Mk 34 GFCS | | | | | | X | | | X | X | X | |
| - SPG-60/SPQ-9 | | | | | | X | | X | X | | X | |
| IR Mk-46 | | | | | | X | X | X | | | | |
| SQQ-89 | | | | | | | | | | | | |
| - Mk-309 ASWFC | | | | | | | | | | | | |
| VOICE COMMS | X | | | X | X | | | | | | X | X |
| GPS | | | | X | | | | | | | | |
| TACAN | | | | | | | | | | | | X |
| RING INFORMATION NET. | | X | X | X | | X | X | X | X | X | X | X |
| WCS | | | | X | | | | | | | X | X |
| ISDS | | | | | | | | | | | | |
| 155 mm GUN | | | | | | | | | | | | |
| CIWS (2) | | | | | | | | | | | | |
| Mk 49 (RAM LNCHR) | | | | | | | | | | | | |
| - RAM | | | | | | | | | | | | |
| VLS | | | | | | | | | | | | |
| - HARPOON | | | | | | | | | | | | |
| - TOMAHAWK | | | | | | | | | | | | |
| - ESS | | | | | | | | | | | | |
| - SM-2 MR | | | | | | | | | | | | |
| - VLA | | | | | | | | | | | | |
| SVTT | | | | | | | | | | | | |
| - MK 50 | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | |
| Oper. Requirements | | | | | | | | | | | | |
| A1 | X | X | | | X | X | | | | | | |
| A2 | | | | | | | | | | | | |
| A3 | X | | | | X | | | | | | | |
| A4 | | | | | | | | | | | | |
| A5 | | | | | | | | | | | | |
| A6 | | | | | | | | | | | | |
| A7 | | | | | | | | | | | | |
| A8 | | | | | | | | | | | | |
| A9 | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | |
| B1 | X | X | X | X | | | | | | | | |
| B2 | | | | | X | X | X | X | X | X | X | X |
| B3 | | | | | | | | | | | | |
| B4 | | | | | | | | | | | | |
| B5 | | | | | | | | | | | | |
| B6 | | | | | | | | | | | | |
| B7 | | | | | | | | | | | | |

| Elements | ELT | | | | | | | | SAR | | | | | | OTW | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Navy Option 1 | Voice Comm | Display | Identify | Threat Eval. | Track | Correlate | Weapons Assgn. | Command | Voice Comm | Display | Identify | Track | Correlate | Command | Voice Comm | Identify | Display | Command |
| SPY-1D | | | | | | | | | | | | | | | | | | |
| SPS-67 | | | | | | | | | | | | | | | | | | |
| TAS | | | | | | | | | | | | | | | | | | |
| SQR-19 | | | | | | | | | | | | | | | | | | |
| SQS-56 | | | | | X | X | | | | | | X | X | | | | | |
| SH-100 | | | | | | | | | | | | | | | | | | |
| SLQ-32 | | X | X | X | | | | | | X | X | | | | | X | X | |
| VIDEO/OPTICAL | | X | X | X | | X | | | | X | X | | X | | | X | X | |
| ACDS | | X | X | X | X | X | X | X | | X | X | X | X | X | | X | X | X |
| CEC | | | | | | | | | | | | | | | | | | |
| JMICS | | X | X | X | X | X | X | X | | X | X | X | X | X | | X | X | X |
| LAMPS | | | X | X | X | X | | | | | X | X | X | | | X | | |
| SMALL BOATS | | | X | X | X | X | | | | | X | X | X | | | X | | |
| IFF | | | X | X | | X | | | | | X | | X | | | X | | |
| MK 99 | | | | | | | | | | | | | | | | | | |
| - SPG-62 | | | | | | | | | | | | | | | | | | |
| Mk 34 GFCS | | X | | | X | X | X | | | X | | X | X | | | | X | |
| - SPG-60/SPQ-9 | | X | | X | X | | X | | | X | | X | | | | X | X | |
| IR Mk-46 | | X | X | X | | | | | | X | X | | | | | X | X | |
| SQQ-89 | | | | | | | | | | | | | | | | | | |
| - Mk-309 ASWFC | | | | | | | | | | | | | | | | | | |
| VOICE COMMS | X | | | | | | X | X | X | | | | | X | X | | | X |
| GPS | | | | | | | | | | | | | | | | | | |
| TACAN | | | | | | | | X | | | | | | X | | | | |
| RING INFORMATION NET. | | X | X | X | X | X | X | X | | X | X | X | X | X | | X | X | X |
| WCS | | | | | | | X | X | | | | | | X | | | | X |
| ISDS | | | | | | | | | | | | | | | | | | |
| 155 mm GUN | | | | | | | | | | | | | | | | | | |
| CIWS (2) | | | | | | | | | | | | | | | | | | |
| Mk 49 (RAM LNCHR) | | | | | | | | | | | | | | | | | | |
| - RAM | | | | | | | | | | | | | | | | | | |
| VLS | | | | | | | | | | | | | | | | | | |
| - HARPOON | | | | | | | | | | | | | | | | | | |
| - TOMAHAWK | | | | | | | | | | | | | | | | | | |
| - ESS | | | | | | | | | | | | | | | | | | |
| - SM-2 MR | | | | | | | | | | | | | | | | | | |
| - VLA | | | | | | | | | | | | | | | | | | |
| SVTT | | | | | | | | | | | | | | | | | | |
| - MK 50 | | | | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | | | | | |
| Oper. Requirements | | | | | | | | | | | | | | | | | | |
| A1 | X | X | | | | | | | X | X | | | | | X | | | |
| A2 | | | | | | | | | | | | | | | | | | |
| A3 | X | | | | | | | | X | | | | | | X | | | |
| A4 | X | X | X | X | X | X | X | X | | | | | | | | | | |
| A5 | | | | | | | | | | | | | | | | | | |
| A6 | | | | | | | | | | | | | | | | | | |
| A7 | | | | | | | | | X | X | X | X | X | X | X | X | X | X |
| A8 | | | | | | | | | | | | | | | | | | |
| A9 | | | | | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | | | | |
| B1 | | | | | | | | | | | | | | | | | | |
| B2 | | | | | | | | | | | | | | | | | | |
| B3 | | | | | | | | | | | | | | | | | | |
| B4 | | | | | | | | | | | | | | | X | X | X | X |
| B5 | | | | | | | | | | | | | | | | | | |
| B6 | | | | | | | | | | | | | | | | | | |
| B7 | | | | | | | | | | | | | | | | | | |

**Table F-2: Functional Allocation - Control (Navy option 1)**

| Elements | AAW | | | | | ASW | | | ASUW | | | | | MIW | | STW | | AMW | | | | ELT | | | | | | | SAR | | | OTW | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Navy Option 1 | Illumination | Weapon Delivery | Guidance | Soft Kill | Kill Eval. | Weapon Delivery | Soft Kill | Kill Eval. | Illumination | Weapon Delivery | Guidance | Soft Kill | Kill Eval. | Mark | Clear | Weapon Delivery | Kill Eval. | Illumination | Weapon Delivery | Guidance | Kill Eval. | Intercept | Board | Illumination | Weapon Delivery | Guidance | Soft Kill | Kill Eval. | Platform Delivery | Evaluation | Facilities (Med. etc) | Platform Delivery | Evaluation | Facilities (Med. etc) |
| SPY-1D | | | | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | |
| SPS-67 | | | | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | |
| TAS | X | | | | X | | | | | | | | X | | | | | | | | | | | X | | | | X | | | | | | |
| SQR-19 | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SQS-56 | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SH-100 | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLQ-32 | | | | X | X | | | | | | | X | X | | | | | | | | | | | | | | X | X | | | | | | |
| VIDEO/OPTICAL | | | | | X | | | | | | | | X | | | | | | | | X | | | | | | | X | | | | | | |
| ACDS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CEC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| JMICS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LAMPS | | | | | X | X | | X | | | | | X | | | | | | | | X | X | X | | | | | X | X | X | | X | X | |
| SMALL BOATS | | | | | | | | | | | | | X | | | X | | | | | | X | X | | | | | X | X | X | | X | X | |
| IFF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MK 99 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| - SPG-62 | X | | X | | | | | | X | | X | | | | | | | | | | | | | X | | X | | | | | | | | |
| Mk 34 GFCS | | | | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | |
| - SPG-60/SPQ-9 | X | | X | | | | | | X | | X | | | | | | | X | | X | | | | X | | X | | | | | | | | |
| IR Mk-46 | | | | | X | | | | | | | X | | | | | | | | | X | | | | | | | X | | | | | | |
| SQQ-89 | | | | | | | | X | | | | | X | | | | | | | | | | | | | | | | | | | | | |
| - Mk-309 ASWFC | | | | | | | | X | | | | | X | | | | | | | | | | | | | | | | | | | | | |
| VOICE COMMS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GPS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TACAN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RING INFORMATION NET. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WCS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 155 mm GUN | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CIWS (2) | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mk 49 (RAM LNCHR) | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| - RAM | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VLS | | X | | | | X | | | | X | | | | | | X | | | | | | | | | | | | | | | | | | |
| - HARPOON | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | |
| - TOMAHAWK | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | |
| - ESS | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| - SM-2 MR | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| - VLA | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SVTT | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| - MK 50 | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SRBOC | | | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | | |
| NIXIE | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | X | X | | | | | | | | | | | | | | | | X | | | X |
| Oper. Requirements | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A4 | | | | | | | | | X | X | X | X | X | | | | | | | | | X | X | X | X | X | X | X | | | | | | |
| A5 | | | | | X | X | | X | | | | | X | | | | | | | | X | X | X | | | | | X | X | X | | X | X | |
| A6 | | | | | | | | | | | | | X | | | | | | | | | X | X | | | | | X | X | X | | X | X | |
| A7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | X | X | X | X |
| A8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A9 | | | | | | | | | | | | | | | | X | X | | | | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | X | X | | | | | | | | | | | | | | | | X | | | X |
| A11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X |
| A13 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B1 | | | | | | | | | | | | | | | | X | X | | | | | | | | | | | | | | | | | |
| B2 | | | | | | | | | | | | | | | | | | X | X | X | | | | | | | | | | | | | | |
| B3 | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | | | | | | | | | | | | | | | | | | |
| B4 | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | | | | | | | | X | X | X | X | X | | | | | | |
| B5 | X | X | X | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B6 | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | | | | | | | | | | | | | | | | | | |
| B7 | | | | | | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | |

Table F-3: Functional Allocation - Engagement (Navy option 1)

| Elements | AAW | | | | | | ASW | | | | ASUW | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Navy Option 2 | Vol Search | ESM | IR | Visual | Organic | Inorganic | Active | Passive | Organic | Inorganic | Surf Search | ESM | IR | Visual | Organic | Inorganic |
| XPAR | X | | | | | | | | | | X | | | | | |
| SPS-67 | X | | | | | | | | | | X | | | | | |
| ATAS | | | | | | | X | X | | | | | | | | |
| SH-100 | | | | | | | | | | | | | | | | |
| SLQ-32 | | X | | | | | | | | | | X | | | | |
| VIDEO/OPTICAL | | | | X | | | | | | | | | | X | | |
| ACDS | | | | | | | | | | | | | | | | |
| CEC | | | | | | | | | | | | | | | | |
| JMICS | | | | | | | | | | | | | | | | |
| PANTHER | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| SMALL BOATS (2) | | | | | | | | | | | | | | X | X | |
| IFF | | | | | | | | | | | | | | | | |
| MK 99 | | | | | | | | | | | | | | | | |
| - SPG-62 | | | | | | | | | | | | | | | | |
| Mk 34 GFCS | | | | | | | | | | | | | | | | |
| - SPG-60/SPQ-9 | X | | | | | | | | | | X | | | | | |
| IR MK-46 | | | X | | | | | | | | | | X | | | |
| SQQ-89 | | | | | | | | | | | | | | | | |
| - MK-116 ASWFC | | | | | | | | | | | | | | | | |
| VOICE COMMS | | | | | | | | | | | | | | | | |
| GPS | | | | | | | | | | | | | | | | |
| TACAN | | | | | | | | | | | | | | | | |
| RING INFO. NETWORK | | | | | | | | | | | | | | | | |
| WCS | | | | | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | | | | | |
| 127 mm GUN | | | | | | | | | | | | | | | | |
| 40 mm GUNS (2) | | | | | | | | | | | | | | | | |
| VLS | | | | | | | | | | | | | | | | |
| - HARPOON | | | | | | | | | | | | | | | | |
| - TOMAHAWK | | | | | | | | | | | | | | | | |
| - ESS | | | | | | | | | | | | | | | | |
| - SM-2 MR | | | | | | | | | | | | | | | | |
| - VLA | | | | | | | | | | | | | | | | |
| SVTT | | | | | | | | | | | | | | | | |
| - MK 50 | | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | | | |
| Oper. Requirements | | | | | | | | | | | | | | | | |
| A1 | | | | | | | | | | | | | | | | |
| A2 | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| A3 | | | | | | | | | | | | | | | | |
| A4 | | | | | | | | | | | X | X | X | X | X | |
| A5 | | | | | X | | | | X | | | | | | X | |
| A6 | | | | | X | | | | X | | | | | | X | |
| A7 | | | | | | | | | | | | | | | | |
| A8 | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| A9 | | | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | | |
| B1 | | | | | | | | | | | | | | | | |
| B2 | | | | | | | | | | | | | | | | |
| B3 | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| B4 | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| B5 | X | X | X | X | X | | | | | | | | | | | |
| B6 | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| B7 | | | | | | | | | | | | | | | | |

| Elements | MIW | | | STW | | AMW | | | ELT | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Navy Option 2 | Ship Board | Organic | Inorganic | Organic | Inorganic | Visual | Organic | Inorganic | Vol. Search | Surf Search | ESM | IR | Visual | Organic | Inorganic |
| XPAR | | | | | | | | | X | X | | | | | |
| SPS-67 | | | | | | | | | X | X | | | | | |
| ATAS | | | | | | | | | | | | | | | |
| SH-100 | X | | | | | | | | | | | | | | |
| SLQ-32 | | | | | | | | | | | X | | | | |
| VIDEO/OPTICAL | | | | | | X | | | | | | | X | | |
| ACDS | | | | | | | | | | | | | | | |
| CEC | | | | | | | | | | | | | | | |
| JMICS | | | | | | | | | | | | | | | |
| PANTHER | | X | | X | | X | X | | X | X | X | X | X | X | |
| SMALL BOATS (2) | | X | | X | | X | X | | | | | | X | X | |
| IFF | | | | | | | | | | | | | | | |
| MK 99 | | | | | | | | | | | | | | | |
| - SPG-62 | | | | | | | | | | | | | | | |
| Mk 34 GFCS | | | | | | | | | | | | | | | |
| - SPG-60/SPQ-9 | | | | | | | | | X | X | | | | | |
| IR MK-46 | | | | | | | | | | | | X | | | |
| SQQ-89 | | | | | | | | | | | | | | | |
| - MK-116 ASWFC | | | | | | | | | | | | | | | |
| VOICE COMMS | | | | | | | | | | | | | | | |
| GPS | | | | | | | | | | | | | | | |
| TACAN | | | | | | | | | | | | | | | |
| RING INFO. NETWORK | | | | | | | | | | | | | | | |
| WCS | | | | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | | | | |
| 127 mm GUN | | | | | | | | | | | | | | | |
| 40 mm GUNS (2) | | | | | | | | | | | | | | | |
| VLS | | | | | | | | | | | | | | | |
| - HARPOON | | | | | | | | | | | | | | | |
| - TOMAHAWK | | | | | | | | | | | | | | | |
| - ESS | | | | | | | | | | | | | | | |
| - SM-2 MR | | | | | | | | | | | | | | | |
| - VLA | | | | | | | | | | | | | | | |
| SVTT | | | | | | | | | | | | | | | |
| - MK 50 | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | |
| EOD TEAM | | X | | | | | | | | | | | | | |
| Oper. Requirements | | | | | | | | | | | | | | | |
| A1 | | | | | | | | | | | | | | | |
| A2 | | | | | | | | | X | X | X | X | X | X | |
| A3 | | | | | | | | | | | | | | | |
| A4 | | | | | | | | | X | X | X | X | X | X | |
| A5 | | | | X | | | X | | | | | | | X | |
| A6 | | | | X | | | X | | | | | | | X | |
| A7 | | | | | | | | | | | | | | | |
| A8 | X | | | | | | | | X | X | X | X | X | X | |
| A9 | | | | | | | | | | | | | | | |
| A10 | X | X | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | |
| B1 | | | | X | | | | | | | | | | | |
| B2 | | | | | | X | X | | | | | | | | |
| B3 | | | | | | | | | | | | | | | |
| B4 | | | | | | | | | | | | | | | |
| B5 | | | | | | | | | | | | | | | |
| B6 | | | | | | | | | | | | | | | |
| B7 | X | X | | | | | | | | | | | | | |

| Elements | SAR | | | | | | | OTW | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Navy Option 2 | Vol. Search | Surf Search | ESM | IR | Visual | Organic | Inorganic | Vol. Search | Surf Search | ESM | IR | Visual | Organic | Inorganic |
| XPAR | X | X | | | | | | X | X | | | | | |
| SPS-67 | X | X | | | | | | X | X | | | | | |
| ATAS | | | | | | | | | | | | | | |
| SH-100 | | | | | | | | | | | | | | |
| SLQ-32 | | | X | | | | | | | X | | | | |
| VIDEO/OPTICAL | | | | | X | | | | | | | X | | |
| ACDS | | | | | | | | | | | | | | |
| CEC | | | | | | | | | | | | | | |
| JMICS | | | | | | | | | | | | | | |
| PANTHER | X | X | X | X | X | X | | X | X | X | X | X | X | |
| SMALL BOATS (2) | | | | | X | X | | | | | | X | X | |
| IFF | | | | | | | | | | | | | | |
| MK 99 | | | | | | | | | | | | | | |
| - SPG-62 | | | | | | | | | | | | | | |
| Mk 34 GFCS | | | | | | | | | | | | | | |
| - SPG-60/SPQ-9 | X | X | | | | | | X | X | | | | | |
| IR MK-46 | | | | X | | | | | | | X | | | |
| SQQ-89 | | | | | | | | | | | | | | |
| - MK-116 ASWFC | | | | | | | | | | | | | | |
| VOICE COMMS | | | | | | | | | | | | | | |
| GPS | | | | | | | | | | | | | | |
| TACAN | | | | | | | | | | | | | | |
| RING INFO. NETWORK | | | | | | | | | | | | | | |
| WCS | | | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | | | |
| 127 mm GUN | | | | | | | | | | | | | | |
| 40 mm GUNS (2) | | | | | | | | | | | | | | |
| VLS | | | | | | | | | | | | | | |
| - HARPOON | | | | | | | | | | | | | | |
| - TOMAHAWK | | | | | | | | | | | | | | |
| - ESS | | | | | | | | | | | | | | |
| - SM-2 MR | | | | | | | | | | | | | | |
| - VLA | | | | | | | | | | | | | | |
| SVTT | | | | | | | | | | | | | | |
| - MK 50 | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | |
| Oper. Requirements | | | | | | | | | | | | | | |
| A1 | | | | | | | | | | | | | | |
| A2 | X | X | X | X | X | X | | X | X | X | X | X | X | |
| A3 | | | | | | | | | | | | | | |
| A4 | | | | | | | | | | | | | | |
| A5 | | | | | | X | | | | | | | X | |
| A6 | | | | | | X | | | | | | | X | |
| A7 | X | X | X | X | X | X | | X | X | X | X | X | X | |
| A8 | X | X | X | X | X | X | | X | X | X | X | X | X | |
| A9 | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | |
| B1 | | | | | | | | | | | | | | |
| B2 | | | | | | | | | | | | | | |
| B3 | | | | | | | | | | | | | | |
| B4 | | | | | | | | | | | | | | |
| B5 | | | | | | | | | | | | | | |
| B6 | | | | | | | | | | | | | | |
| B7 | | | | | | | | | | | | | | |

Table F-4: Functional Allocation - Detection (Navy option 2)

| Elements | AAW | | | | | | | | ASW | | | | | | | | ASUW | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Navy Option 2 | Voice Comm | Display | Identify | Threat Eval. | Track | Correlate | Weapons Assgn | Command | Voice Comm | Display | Identify | Threat Eval. | Track | Correlate | Weapons Assgn | Command | Voice Comm | Display | Identify | Threat Eval. | Track | Correlate | Weapons Assgn | Command |
| XPAR | | | | | | | | | | | | | | | | | | | | | | | | |
| SPS-67 | | | | | | | | | | | | | | | | | | | | | | | | |
| ATAS | | | | | | | | | | | X | X | X | X | | | | | | | | | | |
| SH-100 | | | | | | | | | | X | X | X | X | X | | | | | | | | | | |
| SLQ-32 | | X | X | X | | | X | | | | | | | | | | | X | X | X | | | | |
| VIDEO/OPTICAL | | X | X | X | | X | | | | | | | | | | | | X | X | X | | X | | |
| ACDS | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X |
| CEC | | | | X | X | X | X | X | | | | | | | | | | | | | | | | |
| JMICS | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X |
| PANTHER | | | X | X | X | X | | | | | X | X | X | X | | | | | X | X | X | X | | |
| SMALL BOATS (2) | | | | | | | | | | | | | | | | | | | X | X | X | X | | |
| IFF | | | X | X | | X | | | | | | | | | | | | | X | X | | X | | |
| MK 99 | | | | | X | X | X | | | | | | | | | | | | | | | | | |
| - SPG-62 | | | | | | | | | | | | | | | | | | | | | | | | |
| Mk 34 GFCS | | X | | | X | X | X | | | | | | | | | | | X | | | X | X | X | |
| - SPG-60/SPQ-9 | | X | | X | X | | X | | | | | | | | | | | X | | X | X | | X | |
| IR MK-46 | | X | X | X | | | | | | | | | | | | | | X | X | X | | | | |
| SQQ-89 | | | | | | | | | | X | | X | X | X | X | | | | | | | | | |
| - MK-116 ASWFC | | | | | | | | | | X | | X | X | X | X | | | | | | | | | |
| VOICE COMMS | X | | | | | | X | X | X | | | | | | X | X | X | | | | | | X | X |
| GPS | | | | | | | | X | | | | | | | | X | | | | | | | | X |
| TACAN | | | | | | | | X | | | | | | | | X | | | | | | | | X |
| RING INFO. NETWORK | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X |
| WCS | | | | | | | X | X | | | | | | | X | X | | | | | | | X | X |
| ISDS | | | | | | X | X | X | | | | | | | | | | | | | | | | |
| 127 mm GUN | | | | | | | | | | | | | | | | | | | | | | | | |
| 40 mm GUNS (2) | | | | X | X | X | X | X | | | | | | | | | | | | | | | | |
| VLS | | | | | | | | | | | | | | | | | | | | | | | | |
| - HARPOON | | | | | | | | | | | | | | | | | | | | | | | | |
| - TOMAHAWK | | | | | | | | | | | | | | | | | | | | | | | | |
| - ESS | | | | | | | | | | | | | | | | | | | | | | | | |
| - SM-2 MR | | | | | | | | | | | | | | | | | | | | | | | | |
| - VLA | | | | | | | | | | | | | | | | | | | | | | | | |
| SVTT | | | | | | | | | | | | | | | | | | | | | | | | |
| - MK 50 | | | | | | | | | | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | | | | | | | | | | | |
| Oper. Requirements | | | | | | | | | | | | | | | | | | | | | | | | |
| A1 | X | X | | | | | | | X | X | | | | | | | X | X | | | | | | |
| A2 | | | | | | | | | | | | | | | | | | | | | | | | |
| A3 | X | | | | | | | | X | | | | | | | | X | | | | | | | |
| A4 | | | | | | | | | | | | | | | | | X | X | X | X | X | X | X | X |
| A5 | | | | | | | | | | | | | | | | | | | | | | | | |
| A6 | | | | | | | | | | | | | | | | | | | | | | | | |
| A7 | | | | | | | | | | | | | | | | | | | | | | | | |
| A8 | | | | | | | | | | | | | | | | | | | | | | | | |
| A9 | | | | | | | | | | | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | | | | | | | | | | |
| B1 | | | | | | | | | | | | | | | | | | | | | | | | |
| B2 | | | | | | | | | | | | | | | | | | | | | | | | |
| B3 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| B4 | | | | | | | | | | | | | | | | | | | | | | | | |
| B5 | X | X | X | X | X | X | X | X | | | | | | | | | | | | | | | | |
| B6 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| B7 | | | | | | | | | | | | | | | | | | | | | | | | |

| Elements | MIW | | | | | | | STW | | | | AMW | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Navy Option 2 | Voice Comms | Display | Identify | Threat Eval. | Track | Correlate | Command | Voice Comms | Display | Identify | Command | Voice Comms | Display | Identify | Threat Eval. | Track | Correlate | Weapons Assgn | Command |
| XPAR | | | | | | | | | | | | | | | | | | | |
| SPS-67 | | | | | | | | | | | | | | | | | | | |
| ATAS | | | | | | | | | | | | | | | | | | | |
| SH-100 | | X | X | X | X | X | | | | | | | | | | | | | |
| SLQ-32 | | | | | | | | | X | X | | | X | X | X | | | | |
| VIDEO/OPTICAL | | | | | | | | | X | X | | | X | X | X | | X | | |
| ACDS | | X | X | X | X | X | X | | X | X | X | | X | X | X | X | X | X | X |
| CEC | | | | | | | | | | | | | | | | | | | |
| JMICS | | X | X | X | X | X | X | | X | X | X | | X | X | X | X | X | X | X |
| PANTHER | | | X | X | X | X | | | | | | | | X | X | X | X | | |
| SMALL BOATS (2) | | | X | X | X | X | | | | | | | | X | X | X | X | | |
| IFF | | | | | | | | | | | | | | | | | | | |
| MK 99 | | | | | | | | | | | | | | | | | | | |
| - SPG-62 | | | | | | | | | | | | | | | | | | | |
| Mk 34 GFCS | | | | | | | | | | | | | X | | | X | X | X | |
| - SPG-60/SPQ-9 | | | | | | | | | | | | | X | | X | X | | X | |
| IR MK-46 | | | | | | | | | | | | | X | X | X | | | | |
| SQQ-89 | | | | | | | | | | | | | | | | | | | |
| - MK-116 ASWFC | | | | | | | | | | | | | | | | | | | |
| VOICE COMMS | X | | | | | | | X | | | X | X | | | | | | X | X |
| GPS | | | | | | | | | | | X | | | | | | | | |
| TACAN | | | | | | | X | | | | | | | | | | | | X |
| RING INFO. NETWORK | | X | X | X | X | X | X | | X | X | X | | X | X | X | X | X | X | X |
| WCS | | | | | | | X | | | | X | | | | | | | X | X |
| ISDS | | | | | | | | | | | | | | | | | | | |
| 127 mm GUN | | | | | | | | | | | | | | | | | | | |
| 40 mm GUNS (2) | | | | | | | | | | | | | | | | | | | |
| VLS | | | | | | | | | | | | | | | | | | | |
| - HARPOON | | | | | | | | | | | | | | | | | | | |
| - TOMAHAWK | | | | | | | | | | | | | | | | | | | |
| - ESS | | | | | | | | | | | | | | | | | | | |
| - SM-2 MR | | | | | | | | | | | | | | | | | | | |
| - VLA | | | | | | | | | | | | | | | | | | | |
| SVTT | | | | | | | | | | | | | | | | | | | |
| - MK 50 | | | | | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | | | | | | |
| Oper. Requirements | | | | | | | | | | | | | | | | | | | |
| A1 | X | X | | | | | | X | X | | | X | X | | | | | | |
| A2 | | | | | | | | | | | | | | | | | | | |
| A3 | X | | | | | | | X | | | | X | | | | | | | |
| A4 | | | | | | | | | | | | | | | | | | | |
| A5 | | | | | | | | | | | | | | | | | | | |
| A6 | | | | | | | | | | | | | | | | | | | |
| A7 | | | | | | | | | | | | | | | | | | | |
| A8 | | | | | | | | | | | | | | | | | | | |
| A9 | | | | | | | | | | | | | | | | | | | |
| A10 | X | X | X | X | X | X | X | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | | | | | |
| B1 | | | | | | | | X | X | X | X | | | | | | | | |
| B2 | | | | | | | | | | | | X | X | X | X | X | X | X | X |
| B3 | | | | | | | | | | | | | | | | | | | |
| B4 | | | | | | | | | | | | | | | | | | | |
| B5 | | | | | | | | | | | | | | | | | | | |
| B6 | | | | | | | | | | | | | | | | | | | |
| B7 | X | X | X | X | X | X | X | | | | | | | | | | | | |

| Elements | ELT | | | | | | | | SAR | | | | | | OTW | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Navy Option 2 | Voice Comm | Display | Identify | Threat Eval. | Track | Correlate | Weapons Assgn | Command | Voice Comm | Display | Identify | Track | Correlate | Command | Voice Comm | Identify | Display | Command |
| XPAR | | | | | | | | | | | | | | | | | | |
| SPS-67 | | | | | | | | | | | | | | | | | | |
| ATAS | | | | | | | | | | | | | | | | | | |
| SH-100 | | | | | | | | | | | | | | | | | | |
| SLQ-32 | | X | X | X | | | | | | X | X | | | | | X | X | |
| VIDEO/OPTICAL | | X | X | X | | X | | | | X | X | | X | | | X | X | |
| ACDS | | X | X | X | X | X | X | X | | X | X | X | X | X | | X | X | X |
| CEC | | | | | | | | | | | | | | | | | | |
| JMICS | | X | X | X | X | X | X | X | | X | X | X | X | X | | X | X | X |
| PANTHER | | | X | X | X | X | | | | | X | X | X | | | X | | |
| SMALL BOATS (2) | | | X | X | X | X | | | | | X | X | X | | | X | | |
| IFF | | | X | X | | X | | | | | X | | X | | | X | | |
| MK 99 | | | | | | | | | | | | | | | | | | |
| - SPG-62 | | | | | | | | | | | | | | | | | | |
| Mk 34 GFCS | | X | | | X | X | X | | | X | | X | X | | | | X | |
| - SPG-60/SPQ-9 | | X | | X | X | | X | | | X | | X | | | | X | X | |
| IR MK-46 | | X | X | X | | | | | | X | X | | | | | X | X | |
| SQQ-89 | | | | | | | | | | | | | | | | | | |
| - MK-116 ASWFC | | | | | | | | | | | | | | | | | | |
| VOICE COMMS | X | | | | | | X | X | X | | | | | X | X | | | X |
| GPS | | | | | | | | | | | | | | | | | | |
| TACAN | | | | | | | | X | | | | | | X | | | | |
| RING INFO. NETWORK | | X | X | X | X | X | X | X | | X | X | X | X | X | | X | X | X |
| WCS | | | | | | | X | X | | | | | | X | | | | X |
| ISDS | | | | | | | | | | | | | | | | | | |
| 127 mm GUN | | | | | | | | | | | | | | | | | | |
| 40 mm GUNS (2) | | | | | | | | | | | | | | | | | | |
| VLS | | | | | | | | | | | | | | | | | | |
| - HARPOON | | | | | | | | | | | | | | | | | | |
| - TOMAHAWK | | | | | | | | | | | | | | | | | | |
| - ESS | | | | | | | | | | | | | | | | | | |
| - SM-2 MR | | | | | | | | | | | | | | | | | | |
| - VLA | | | | | | | | | | | | | | | | | | |
| SVTT | | | | | | | | | | | | | | | | | | |
| - MK 50 | | | | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | | | | | |
| Oper. Requirements | | | | | | | | | | | | | | | | | | |
| A1 | X | X | | | | | | | X | X | | | | | X | | | |
| A2 | | | | | | | | | | | | | | | | | | |
| A3 | X | | | | | | | | X | | | | | | X | | | |
| A4 | X | X | X | X | X | X | X | X | | | | | | | | | | |
| A5 | | | | | | | | | | | | | | | | | | |
| A6 | | | | | | | | | | | | | | | | | | |
| A7 | | | | | | | | | X | X | X | X | X | X | X | X | X | X |
| A8 | | | | | | | | | | | | | | | | | | |
| A9 | | | | | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | | | | |
| B1 | | | | | | | | | | | | | | | | | | |
| B2 | | | | | | | | | | | | | | | | | | |
| B3 | | | | | | | | | | | | | | | | | | |
| B4 | | | | | | | | | | | | | | | X | X | X | X |
| B5 | | | | | | | | | | | | | | | | | | |
| B6 | | | | | | | | | | | | | | | | | | |
| B7 | | | | | | | | | | | | | | | | | | |

**Table F-5: Functional Allocation - Control (Navy option 2)**

| Elements | AAW | | | | | ASW | | | ASUW | | | | | MIW | | STW | | AMW | | | | ELT | | | | | | | SAR | | | OTW | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Navy Option 2 | Illumination | Weapon Delivery | Guidance | Soft Kill | Kill Eval. | Weapon Delivery | Soft Kill | Kill Eval. | Illumination | Weapon Delivery | Guidance | Soft Kill | Kill Eval. | Mark | Clear | Weapon Delivery | Kill Eval. | Illumination | Weapon Delivery | Guidance | Kill Eval. | Intercept | Board | Illumination | Weapon Delivery | Guidance | Soft Kill | Kill Eval. | Platform Delivery | Evaluation | Facilities (Med. et | Platform Delivery | Evaluation | Facilities (Med. et |
| XPAR | | | | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | |
| SPS-67 | | | | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | |
| ATAS | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SH-100 | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLQ-32 | | | | X | X | | | | | | | X | X | | | | | | | | | | | | | | X | X | | | | | | |
| VIDEO/OPTICAL | | | | | X | | | | | | | | X | | | | | | | | X | | | | | | | X | | | | | | |
| ACDS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CEC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| JMICS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LAMPS | | | | | X | X | | X | | | | | X | | | | | | | | X | X | X | | | | | X | X | X | | X | X | |
| SMALL BOATS (2) | | | | | | | | | | | | | X | | | X | | | | | | X | X | | | | | X | X | X | | X | X | |
| IFF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MK 99 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| - SPG-62 | X | | X | | | | | | X | | X | | | | | | | | | | | | | X | | X | | | | | | | | |
| Mk 34 GFCS | | | | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | |
| - SPG-60/SPQ-9 | X | | X | | | | | | X | | X | | | | | | | X | | X | | | | X | | X | | | | | | | | |
| IR MK-46 | | | | | X | | | | | | | X | | | | | | | | | X | | | | | | | X | | | | | | |
| SQQ-89 | | | | | | | | X | | | | | X | | | | | | | | | | | | | | | | | | | | | |
| - MK-116 ASWFC | | | | | | | | X | | | | | X | | | | | | | | | | | | | | | | | | | | | |
| VOICE COMMS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GPS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TACAN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RING INFO. NETWORK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WCS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 127 mm GUN | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 40 mm GUNS (2) | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VLS | | X | | | | X | | | | X | | | | | | X | | | | | | | | | | | | | | | | | | |
| - HARPOON | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | |
| - TOMAHAWK | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | |
| - ESS | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| - SM-2 MR | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| - VLA | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SVTT | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| - MK 50 | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SRBOC | | | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | | |
| NIXIE | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | X | X | | | | | | | | | | | | | | | | X | | | X |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Oper. Requirements | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A4 | | | | | | | | | X | X | X | X | X | | | | | | | | | X | X | X | X | X | X | X | | | | | | |
| A5 | | | | | X | X | | X | | | | | X | | | | | | | | X | X | X | | | | | X | X | X | | X | X | |
| A6 | | | | | | | | | | | | | X | | | | | | | | | X | X | | | | | X | X | X | | X | X | |
| A7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | X | X | X | X |
| A8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A9 | | | | | | | | | | | | | | | | X | X | | | | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | X | X | | | | | | | | | | | | | | | | X | | | X |
| A11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X |
| A13 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B1 | | | | | | | | | | | | | | | | X | X | | | | | | | | | | | | | | | | | |
| B2 | | | | | | | | | | | | | | | | | | X | X | X | | | | | | | | | | | | | | |
| B3 | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | | | | | | | | | | | | | | | | | | |
| B4 | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | | | | | | | | X | X | X | X | X | | | | | | |
| B5 | X | X | X | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B6 | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | | | | | | | | | | | | | | | | | | |
| B7 | | | | | | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | |

**Table F-6: Functional Allocation - Engagement (Navy option 2)**

| Elements | AAW | | | | | | ASW | | | | ASUW | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Navy Option 3 | Vol Search | ESM | IR | Visual | Organic | Inorganic | Active | Passive | Organic | Inorganic | Surf Search | ESM | IR | Visual | Organic | Inorganic |
| SPS-49 | X | | | | | | | | | | X | | | | | |
| SPS-67 | X | | | | | | | | | | X | | | | | |
| TAS | X | | | | | | | | | | X | | | | | |
| SQR-19 | | | | | | | | X | | | | | | | | |
| SUTEC DOUBLE EAGLE | | | | | | | X | X | | | | X | | | | |
| SLQ-32 | | X | | | | | | | | | | X | | | | |
| VIDEO/OPTICAL | | | | X | | | | | | | | | | X | | |
| ACDS | | | | | | | | | | | | | | | | |
| CEC | | | | | | | | | | | | | | | | |
| JMICS | | | | | | | | | | | | | | | | |
| PANTHER | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| SMALL BOATS (2) | | | | | | | | | | | | | | X | X | |
| IFF | | | | | | | | | | | | | | | | |
| MK 86 GFCS | | | | | | | | | | | | | | | | |
| - SPG-60/SPQ-9 | X | | | | | | | | | | X | | | | | |
| IR MK-46 | | | X | | | | | | | | | | X | | | |
| SQQ-89 | | | | | | | | | | | | | | | | |
| VOICE COMMS | | | | | | | | | | | | | | | | |
| GPS | | | | | | | | | | | | | | | | |
| TACAN | | | | | | | | | | | | | | | | |
| RING INFO. NETWORK | | | | | | | | | | | | | | | | |
| WCS | | | | | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | | | | | |
| 127 mm GUN | | | | | | | | | | | | | | | | |
| 40 mm GUNS (2) | | | | | | | | | | | | | | | | |
| CANNISTER | | | | | | | | | | | | | | | | |
| - HARPOON | | | | | | | | | | | | | | | | |
| ABL | | | | | | | | | | | | | | | | |
| - TOMAHAWK | | | | | | | | | | | | | | | | |
| MK49 (RAM LNCHER) | | | | | | | | | | | | | | | | |
| - RAM | | | | | | | | | | | | | | | | |
| SVTT | | | | | | | | | | | | | | | | |
| - MK 50 | | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| Oper. Requirements | | | | | | | | | | | | | | | | |
| A1 | | | | | | | | | | | | | | | | |
| A2 | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| A3 | | | | | | | | | | | | | | | | |
| A4 | | | | | | | | | | | X | X | X | X | X | |
| A5 | | | | | X | | | | X | | | | | | X | |
| A6 | | | | | X | | | | X | | | | | | X | |
| A7 | | | | | | | | | | | | | | | | |
| A8 | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| A9 | | | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| B1 | | | | | | | | | | | | | | | | |
| B2 | | | | | | | | | | | | | | | | |
| B3 | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| B4 | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| B5 | X | X | X | X | X | | | | | | | | | | | |
| B6 | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| B7 | | | | | | | | | | | | | | | | |

| Elements | MIW | | | STW | | AMW | | | ELT | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Navy Option 3 | Ship Board | Organic | Inorganic | Organic | Inorganic | Visual | Organic | Inorganic | Vol. Search | Surf Search | ESM | IR | Visual | Organic | Inorganic |
| SPS-49 | | | | | | | | | X | X | | | | | |
| SPS-67 | | | | | | | | | X | X | | | | | |
| TAS | | | | | | | | | X | X | | | | | |
| SQR-19 | | | | | | | | | | | | | | | |
| SUTEC DOUBLE EAGLE | X | | | | | | | | | | | | | | |
| SLQ-32 | | | | | | | | | | | X | | | | |
| VIDEO/OPTICAL | | | | | | X | | | | | | | X | | |
| ACDS | | | | | | | | | | | | | | | |
| CEC | | | | | | | | | | | | | | | |
| JMICS | | | | | | | | | | | | | | | |
| PANTHER | | X | | X | | X | X | | X | X | X | X | X | X | |
| SMALL BOATS (2) | | X | | X | | X | X | | | | | | X | X | |
| IFF | | | | | | | | | | | | | | | |
| MK 86 GFCS | | | | | | | | | | | | | | | |
| - SPG-60/SPQ-9 | | | | | | | | | X | X | | | | | |
| IR MK-46 | | | | | | | | | | | | X | | | |
| SQQ-89 | | | | | | | | | | | | | | | |
| VOICE COMMS | | | | | | | | | | | | | | | |
| GPS | | | | | | | | | | | | | | | |
| TACAN | | | | | | | | | | | | | | | |
| RING INFO. NETWORK | | | | | | | | | | | | | | | |
| WCS | | | | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | | | | |
| 127 mm GUN | | | | | | | | | | | | | | | |
| 40 mm GUNS (2) | | | | | | | | | | | | | | | |
| CANNISTER | | | | | | | | | | | | | | | |
| - HARPOON | | | | | | | | | | | | | | | |
| ABL | | | | | | | | | | | | | | | |
| - TOMAHAWK | | | | | | | | | | | | | | | |
| MK49 (RAM LNCHER) | | | | | | | | | | | | | | | |
| - RAM | | | | | | | | | | | | | | | |
| SVTT | | | | | | | | | | | | | | | |
| - MK 50 | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | |
| EOD TEAM | | X | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| Oper. Requirements | | | | | | | | | | | | | | | |
| A1 | | | | | | | | | | | | | | | |
| A2 | | | | | | | | | X | X | X | X | X | X | |
| A3 | | | | | | | | | | | | | | | |
| A4 | | | | | | | | | X | X | X | X | X | X | |
| A5 | | | | X | | | X | | | | | | | X | |
| A6 | | | | X | | | X | | | | | | | X | |
| A7 | | | | | | | | | | | | | | | |
| A8 | X | | | | | | | | X | X | X | X | X | X | |
| A9 | | | | | | | | | | | | | | | |
| A10 | X | X | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| B1 | | | | X | | | | | | | | | | | |
| B2 | | | | | | X | X | | | | | | | | |
| B3 | | | | | | | | | | | | | | | |
| B4 | | | | | | | | | | | | | | | |
| B5 | | | | | | | | | | | | | | | |
| B6 | | | | | | | | | | | | | | | |
| B7 | X | X | | | | | | | | | | | | | |

| Elements | SAR | | | | | | | OTW | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Navy Option 3 | Vol. Search | Surf Search | ESM | IR | Visual | Organic | Inorganic | Vol. Search | Surf Search | ESM | IR | Visual | Organic | Inorganic |
| SPS-49 | X | X | | | | | | X | X | | | | | |
| SPS-67 | X | X | | | | | | X | X | | | | | |
| TAS | X | X | | | | | | X | X | | | | | |
| SQR-19 | | | | | | | | | | | | | | |
| SUTEC DOUBLE EAGLE | | | | | | | | | | | | | | |
| SLQ-32 | | | X | | | | | | | X | | | | |
| VIDEO/OPTICAL | | | | | X | | | | | | | X | | |
| ACDS | | | | | | | | | | | | | | |
| CEC | | | | | | | | | | | | | | |
| JMICS | | | | | | | | | | | | | | |
| PANTHER | X | X | X | X | X | X | | X | X | X | X | X | X | |
| SMALL BOATS (2) | | | | | X | X | | | | | | X | X | |
| IFF | | | | | | | | | | | | | | |
| MK 86 GFCS | | | | | | | | | | | | | | |
| - SPG-60/SPQ-9 | X | X | | | | | | X | X | | | | | |
| IR MK-46 | | | | X | | | | | | | X | | | |
| SQQ-89 | | | | | | | | | | | | | | |
| VOICE COMMS | | | | | | | | | | | | | | |
| GPS | | | | | | | | | | | | | | |
| TACAN | | | | | | | | | | | | | | |
| RING INFO. NETWORK | | | | | | | | | | | | | | |
| WCS | | | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | | | |
| 127 mm GUN | | | | | | | | | | | | | | |
| 40 mm GUNS (2) | | | | | | | | | | | | | | |
| CANNISTER | | | | | | | | | | | | | | |
| - HARPOON | | | | | | | | | | | | | | |
| ABL | | | | | | | | | | | | | | |
| - TOMAHAWK | | | | | | | | | | | | | | |
| MK49 (RAM LNCHER) | | | | | | | | | | | | | | |
| - RAM | | | | | | | | | | | | | | |
| SVTT | | | | | | | | | | | | | | |
| - MK 50 | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| Oper. Requirements | | | | | | | | | | | | | | |
| A1 | | | | | | | | | | | | | | |
| A2 | X | X | X | X | X | X | | X | X | X | X | X | X | |
| A3 | | | | | | | | | | | | | | |
| A4 | | | | | | | | | | | | | | |
| A5 | | | | | | X | | | | | | | X | |
| A6 | | | | | | X | | | | | | | X | |
| A7 | X | X | X | X | X | X | | X | X | X | X | X | X | |
| A8 | X | X | X | X | X | X | | X | X | X | X | X | X | |
| A9 | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| B1 | | | | | | | | | | | | | | |
| B2 | | | | | | | | | | | | | | |
| B3 | | | | | | | | | | | | | | |
| B4 | | | | | | | | | | | | | | |
| B5 | | | | | | | | | | | | | | |
| B6 | | | | | | | | | | | | | | |
| B7 | | | | | | | | | | | | | | |

Table F-7: Functional Allocation - Detection (Navy option 3)

| Elements | AAW | | | | | | | | ASW | | | | | | | | ASUW | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Navy Option 3 | Voice Comm | Display | Identify | Threat Eval. | Track | Correlate | Weapons Assg | Command | Voice Comm | Display | Identify | Threat Eval. | Track | Correlate | Weapons Assg | Command | Voice Comm | Display | Identify | Threat Eval. | Track | Correlate | Weapons Assg | Command |
| SPS-49 | | | | | | | | | | | | | | | | | | | | | | | | |
| SPS-67 | | | | | | | | | | | | | | | | | | | | | | | | |
| TAS | | | | | | | | | | | | | | | | | | | | | | | | |
| SQR-19 | | | | | | | | | | | X | X | X | X | | | | | | | | | | |
| SUTEC DOUBLE EAGLE | | | | | | | | | | X | X | X | X | X | | | | | | | | | | |
| SLQ-32 | | X | X | X | | | X | | | | | | | | | | | X | X | X | | | | |
| VIDEO/OPTICAL | | X | X | X | | X | | | | | | | | | | | | X | X | X | | X | | |
| ACDS | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X |
| CEC | | | | X | X | X | X | X | | | | | | | | | | | | | | | | |
| JMICS | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X |
| PANTHER | | | X | X | X | X | | | | | X | X | X | X | | | | | X | X | X | X | | |
| SMALL BOATS (2) | | | | | | | | | | | | | | | | | | | X | X | X | X | | |
| IFF | | | X | X | | X | | | | | | | | | | | | | X | X | | X | | |
| MK 86 GFCS | | X | | | X | X | X | | | | | | | | | | | X | | | X | X | X | |
| - SPG-60/SPQ-9 | | X | | X | X | | X | | | | | | | | | | | X | | X | X | | X | |
| IR MK-46 | | X | X | X | | | | | | | | | | | | | | X | X | X | | | | |
| SQQ-89 | | | | | | | | | | X | | X | X | X | X | | | | | | | | | |
| VOICE COMMS | X | | | | | | X | X | X | | | | | | X | X | X | | | | | | X | X |
| GPS | | | | | | | | X | | | | | | | | X | | | | | | | | X |
| TACAN | | | | | | | | X | | | | | | | | X | | | | | | | | X |
| RING INFO. NETWORK | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X |
| WCS | | | | | | | X | X | | | | | | | X | X | | | | | | | X | X |
| ISDS | | | | | | X | X | X | | | | | | | | | | | | | | | | |
| 127 mm GUN | | | | | | | | | | | | | | | | | | | | | | | | |
| 40 mm GUNS (2) | | | | X | X | X | X | X | | | | | | | | | | | | | | | | |
| CANNISTER | | | | | | | | | | | | | | | | | | | | | | | | |
| - HARPOON | | | | | | | | | | | | | | | | | | | | | | | | |
| ABL | | | | | | | | | | | | | | | | | | | | | | | | |
| - TOMAHAWK | | | | | | | | | | | | | | | | | | | | | | | | |
| MK49 (RAM LNCHER) | | | | | | | | | | | | | | | | | | | | | | | | |
| - RAM | | | | | | | | | | | | | | | | | | | | | | | | |
| SVTT | | | | | | | | | | | | | | | | | | | | | | | | |
| - MK 50 | | | | | | | | | | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | | | | | | | | | | | |
| Oper. Requirements | | | | | | | | | | | | | | | | | | | | | | | | |
| A1 | X | X | | | | | | | X | X | | | | | | | X | X | | | | | | |
| A2 | | | | | | | | | | | | | | | | | | | | | | | | |
| A3 | X | | | | | | | | X | | | | | | | | X | | | | | | | |
| A4 | | | | | | | | | | | | | | | | | X | X | X | X | X | X | X | X |
| A5 | | | | | | | | | | | | | | | | | | | | | | | | |
| A6 | | | | | | | | | | | | | | | | | | | | | | | | |
| A7 | | | | | | | | | | | | | | | | | | | | | | | | |
| A8 | | | | | | | | | | | | | | | | | | | | | | | | |
| A9 | | | | | | | | | | | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | | | | | | | | | | |
| B1 | | | | | | | | | | | | | | | | | | | | | | | | |
| B2 | | | | | | | | | | | | | | | | | | | | | | | | |
| B3 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| B4 | | | | | | | | | | | | | | | | | | | | | | | | |
| B5 | X | X | X | X | X | X | X | X | | | | | | | | | | | | | | | | |
| B6 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| B7 | | | | | | | | | | | | | | | | | | | | | | | | |

| Elements | MIW | | | | | | | STW | | | | AMW | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Navy Option 3 | Voice Comms | Display | Identify | Threat Eval. | Track | Correlate | Command | Voice Comms | Display | Identify | Command | Voice Comms | Display | Identify | Threat Eval. | Track | Correlate | Weapons Assg | Command |
| SPS-49 | | | | | | | | | | | | | | | | | | | |
| SPS-67 | | | | | | | | | | | | | | | | | | | |
| TAS | | | | | | | | | | | | | | | | | | | |
| SQR-19 | | | | | | | | | | | | | | | | | | | |
| SUTEC DOUBLE EAGLE | | X | X | X | X | X | | | | | | | | | | | | | |
| SLQ-32 | | | | | | | | | X | X | | | X | X | X | | | | |
| VIDEO/OPTICAL | | | | | | | | | X | X | | | X | X | X | | X | | |
| ACDS | | X | X | X | X | X | X | | X | X | X | | X | X | X | X | X | X | X |
| CEC | | | | | | | | | | | | | | | | | | | |
| JMICS | | X | X | X | X | X | X | | X | X | X | | X | X | X | X | X | X | X |
| PANTHER | | | X | X | X | X | | | | | | | | X | X | X | X | | |
| SMALL BOATS (2) | | | X | X | X | X | | | | | | | | X | X | X | X | | |
| IFF | | | | | | | | | | | | | | | | | | | |
| MK 86 GFCS | | | | | | | | | | | | | X | | | X | X | X | |
| - SPG-60/SPQ-9 | | | | | | | | | | | | | X | | X | X | | X | |
| IR MK-46 | | | | | | | | | | | | | X | X | X | | | | |
| SQQ-89 | | | | | | | | | | | | | | | | | | | |
| VOICE COMMS | X | | | | | | | X | | | X | X | | | | | | X | X |
| GPS | | | | | | | | | | | X | | | | | | | | |
| TACAN | | | | | | | X | | | | | | | | | | | | X |
| RING INFO. NETWORK | | X | X | X | X | X | X | | X | X | X | | X | X | X | X | X | X | X |
| WCS | | | | | | | X | | | | X | | | | | | | X | X |
| ISDS | | | | | | | | | | | | | | | | | | | |
| 127 mm GUN | | | | | | | | | | | | | | | | | | | |
| 40 mm GUNS (2) | | | | | | | | | | | | | | | | | | | |
| CANNISTER | | | | | | | | | | | | | | | | | | | |
| - HARPOON | | | | | | | | | | | | | | | | | | | |
| ABL | | | | | | | | | | | | | | | | | | | |
| - TOMAHAWK | | | | | | | | | | | | | | | | | | | |
| MK49 (RAM LNCHER) | | | | | | | | | | | | | | | | | | | |
| - RAM | | | | | | | | | | | | | | | | | | | |
| SVTT | | | | | | | | | | | | | | | | | | | |
| - MK 50 | | | | | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | | | | | | |
| Oper. Requirements | | | | | | | | | | | | | | | | | | | |
| A1 | X | X | | | | | | X | X | | | X | X | | | | | | |
| A2 | | | | | | | | | | | | | | | | | | | |
| A3 | X | | | | | | | X | | | | X | | | | | | | |
| A4 | | | | | | | | | | | | | | | | | | | |
| A5 | | | | | | | | | | | | | | | | | | | |
| A6 | | | | | | | | | | | | | | | | | | | |
| A7 | | | | | | | | | | | | | | | | | | | |
| A8 | | | | | | | | | | | | | | | | | | | |
| A9 | | | | | | | | | | | | | | | | | | | |
| A10 | X | X | X | X | X | X | X | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | | | | | |
| B1 | | | | | | | | X | X | X | X | | | | | | | | |
| B2 | | | | | | | | | | | | X | X | X | X | X | X | X | X |
| B3 | | | | | | | | | | | | | | | | | | | |
| B4 | | | | | | | | | | | | | | | | | | | |
| B5 | | | | | | | | | | | | | | | | | | | |
| B6 | | | | | | | | | | | | | | | | | | | |
| B7 | X | X | X | X | X | X | X | | | | | | | | | | | | |

| Elements | ELT | | | | | | | | SAR | | | | | | OTW | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Navy Option 3 | Voice Comm | Display | Identify | Threat Eval. | Track | Correlate | Weapons Assg | Command | Voice Comm | Display | Identify | Track | Correlate | Command | Voice Comm | Identify | Display | Command |
| SPS-49 | | | | | | | | | | | | | | | | | | |
| SPS-67 | | | | | | | | | | | | | | | | | | |
| TAS | | | | | | | | | | | | | | | | | | |
| SQR-19 | | | | | | | | | | | | | | | | | | |
| SUTEC DOUBLE EAGLE | | | | | | | | | | | | | | | | | | |
| SLQ-32 | | X | X | X | | | | | | X | X | | | | | X | X | |
| VIDEO/OPTICAL | | X | X | X | | X | | | | X | X | | X | | | X | X | |
| ACDS | | X | X | X | X | X | X | X | | X | X | X | X | X | | X | X | X |
| CEC | | | | | | | | | | | | | | | | | | |
| JMICS | | X | X | X | X | X | X | X | | X | X | X | X | X | | X | X | X |
| PANTHER | | | X | X | X | X | | | | | X | X | X | | | X | | |
| SMALL BOATS (2) | | | X | X | X | X | | | | | X | X | X | | | X | | |
| IFF | | | X | X | | X | | | | | X | | X | | | X | | |
| MK 86 GFCS | | X | | | X | X | X | | | X | | X | X | | | | X | |
| - SPG-60/SPQ-9 | | X | | X | X | | X | | | X | | X | | | | X | X | |
| IR MK-46 | | X | X | X | | | | | | X | X | | | | | X | X | |
| SQQ-89 | | | | | | | | | | | | | | | | | | |
| VOICE COMMS | X | | | | | | X | X | X | | | | | X | X | | | X |
| GPS | | | | | | | | | | | | | | | | | | |
| TACAN | | | | | | | | X | | | | | | X | | | | |
| RING INFO. NETWORK | | X | X | X | X | X | X | X | | X | X | X | X | X | | X | X | X |
| WCS | | | | | | | X | X | | | | | | X | | | | X |
| ISDS | | | | | | | | | | | | | | | | | | |
| 127 mm GUN | | | | | | | | | | | | | | | | | | |
| 40 mm GUNS (2) | | | | | | | | | | | | | | | | | | |
| CANNISTER | | | | | | | | | | | | | | | | | | |
| - HARPOON | | | | | | | | | | | | | | | | | | |
| ABL | | | | | | | | | | | | | | | | | | |
| - TOMAHAWK | | | | | | | | | | | | | | | | | | |
| MK49 (RAM LNCHER) | | | | | | | | | | | | | | | | | | |
| - RAM | | | | | | | | | | | | | | | | | | |
| SVTT | | | | | | | | | | | | | | | | | | |
| - MK 50 | | | | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | | | | | |
| Oper. Requirements | | | | | | | | | | | | | | | | | | |
| A1 | X | X | | | | | | | X | X | | | | | X | | | |
| A2 | | | | | | | | | | | | | | | | | | |
| A3 | X | | | | | | | | X | | | | | | X | | | |
| A4 | X | X | X | X | X | X | X | X | | | | | | | | | | |
| A5 | | | | | | | | | | | | | | | | | | |
| A6 | | | | | | | | | | | | | | | | | | |
| A7 | | | | | | | | | | | | | | | | | | |
| A8 | | | | | | | | | X | X | X | X | X | X | X | X | X | X |
| A9 | | | | | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | | | | |
| B1 | | | | | | | | | | | | | | | | | | |
| B2 | | | | | | | | | | | | | | | | | | |
| B3 | | | | | | | | | | | | | | | | | | |
| B4 | | | | | | | | | | | | | | | | | | |
| B5 | | | | | | | | | | | | | | | X | X | X | X |
| B6 | | | | | | | | | | | | | | | | | | |
| B7 | | | | | | | | | | | | | | | | | | |

Table F-8: Functional Allocation - Control (Navy option 3)

| Elements | AAW | | | | | ASW | | | ASUW | | | | | MIW | | STW | | AMW | | | | ELT | | | | | | | SAR | | | OTW | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Navy Option 3 | Illumination | Weapon Delivery | Guidance | Soft Kill | Kill Eval. | Weapon Delivery | Soft Kill | Kill Eval. | Illumination | Weapon Delivery | Guidance | Soft Kill | Kill Eval. | Mark | Clear | Weapon Delivery | Kill Eval. | Illumination | Weapon Delivery | Guidance | Kill Eval. | Intercept | Board | Illumination | Weapon Delivery | Guidance | Soft Kill | Kill Eval. | Platform Delivery | Evaluation | Facilities (Med. et | Platform Delivery | Evaluation | Facilities (Med. et |
| SPS-49 | | | | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | |
| SPS-67 | | | | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | |
| TAS | X | | | | X | | | | | | | | X | | | | | | | | | | | X | | | | X | | | | | | |
| SQR-19 | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SUTEC DOUBLE EAGLE | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLQ-32 | | | | X | X | | | | | | | X | X | | | | | | | | | | | | | | X | X | | | | | | |
| VIDEO/OPTICAL | | | | | X | | | | | | | | X | | | | | | | | X | | | | | | | X | | | | | | |
| ACDS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CEC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| JMICS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PANTHER | | | | | X | X | | X | | | | | X | | | | | | | | X | X | X | | | | | X | X | X | | X | X | |
| SMALL BOATS (2) | | | | | | | | | | | | | X | | | X | | | | | | X | X | | | | | X | X | X | | X | X | |
| IFF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MK 86 GFCS | | | | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | |
| - SPG-60/SPQ-9 | X | | X | | | | | | X | | X | | | | | | | X | | X | | | | X | | X | | | | | | | | |
| IR MK-46 | | | | | X | | | | | | | X | | | | | | | | | X | | | | | | | X | | | | | | |
| SQQ-89 | | | | | | | | X | | | | | X | | | | | | | | | | | | | | | | | | | | | |
| VOICE COMMS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GPS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TACAN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RING INFO. NETWORK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WCS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 127 mm GUN | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 40 mm GUNS (2) | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CANNISTER | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | |
| - HARPOON | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | |
| ABL | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | |
| - TOMAHAWK | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | |
| MK49 (RAM LNCHER) | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| - RAM | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SVTT | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| - MK 50 | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SRBOC | | | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | | |
| NIXIE | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | X | X | | | | | | | | | | | | | | | | X | | | X |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Oper. Requirements | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A4 | | | | | | | | | X | X | X | X | X | | | | | | | | | X | X | X | X | X | X | X | | | | | | |
| A5 | | | | | X | X | | X | | | | | X | | | | | | | | X | X | X | | | | | X | X | X | | X | X | |
| A6 | | | | | | | | | | | | | X | | | | | | | | | X | X | | | | | X | X | X | | X | X | |
| A7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | X | X | X | X |
| A8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A9 | | | | | | | | | | | | | | | | X | X | | | | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | X | X | | | | | | | | | | | | | | | | X | | | X |
| A11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X |
| A13 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B1 | | | | | | | | | | | | | | | | X | X | | | | | | | | | | | | | | | | | |
| B2 | | | | | | | | | | | | | | | | | | X | X | X | | | | | | | | | | | | | | |
| B3 | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | | | | | | | | | | | | | | | | | | |
| B4 | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | | | | | | | | X | X | X | X | X | | | | | | |
| B5 | X | X | X | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B6 | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | | | | | | | | | | | | | | | | | | |
| B7 | | | | | | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | |

**Table F-9: Functional Allocation - Engagement (Navy option 3)**

| Elements | AAW | | | | | | ASW | | | | ASUW | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coast Guard Option 1 | Vol Search | ESM | IR | Visual | Organic | Inorganic | Active | Passive | Organic | Inorganic | Surf Search | ESM | IR | Visual | Organic | Inorganic |
| SPY-1D | X | | | | | | | | | | X | | | | | |
| SPS-67 | X | | | | | | | | | | X | | | | | |
| TAS | X | | | | | | | | | | X | | | | | |
| SQS-56 | | | | | | | X | X | | | | X | | | | |
| SH-100 | | | | | | | | | | | | | | | | |
| SLQ-32 | | X | | | | | | | | | | X | | | | |
| VIDEO/OPTICAL | | | | X | | | | X | | | | | | X | | |
| ACDS | | | | | | | | | | | | | | | | |
| CEC | | | | | | | | | | | | | | | | |
| JMCIS | | | | | | | | | | | | | | | | |
| DOLPHIN | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| SMALL BOATS (4) | | | | | | | | | X | | | | | X | X | |
| IFF | | | | | | | | | | | | | | | | |
| MK 92 GFCS | | | | | | | | | | | | | | | | |
| CAS/STIR | X | | | | | | | | | | X | | | | | |
| IR Mk-46 | | | X | | | | | | | | | | X | | | |
| SQQ-89 | | | | | | | | | | | | | | | | |
| Mk-309 ASWFC | | | | | | | | | | | | | | | | |
| VOICE COMMS | | | | | | | | | | | | | | | | |
| GPS | | | | | | | | | | | | | | | | |
| TACAN | | | | | | | | | | | | | | | | |
| RING INFO. NETWORK | | | | | | | | | | | | | | | | |
| WCS | | | | | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | | | | | |
| 76 MM | | | | | | | | | | | | | | | | |
| CIWS (1) | | | | | | | | | | | | | | | | |
| Mk 49 (RAM LNCHR) | | | | | | | | | | | | | | | | |
| RAM | | | | | | | | | | | | | | | | |
| SVTT | | | | | | | | | | | | | | | | |
| MK 50 | | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | | |
| BUOY EQUIP | | | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| Requirements | | | | | | | | | | | | | | | | |
| A1 | | | | | | | | | | | | | | | | |
| A2 | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| A3 | | | | | | | | | | | | | | | | |
| A4 | | | | | | | | | | | X | X | X | X | X | |
| A5 | | | | | X | | | | X | | | | | | | |
| A6 | | | | | X | | | | X | | | | | | | |
| A7 | | | | | | | | | | | | | | | | |
| A8 | X | X | X | X | X | | | | | | X | X | X | X | X | |
| A9 | | | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| C1 | X | X | X | X | X | | | | | | X | X | X | X | X | |
| C2 | X | X | X | X | X | | | | | | X | X | X | X | X | |
| C3 | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| C4 | | | | | | | | | | | | | | | | |
| C5 | | | | | | | | | | | | | | | | |
| C6 | | | | | | | | | | | | | | | | |
| C7 | | | | | | | | | | | | | | | | |
| C8 | X | X | X | X | X | | | | | | X | X | X | X | X | |

| Elements | MIW | | | STW | | AMW | | | ELT | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coast Guard Option 1 | Ship Board | Organic | Inorganic | Organic | Inorganic | Visual | Organic | Inorganic | Vol. Search | Surf Search | ESM | IR | Visual | Organic | Inorganic |
| SPY-1D | | | | | | | | | X | X | | | | | |
| SPS-67 | | | | | | | | | X | X | | | | | |
| TAS | | | | | | | | | | | | | | | |
| SQS-56 | X | | | | | | | | | | | | | | |
| SH-100 | X | | | | | | | | | | | | | | |
| SLQ-32 | | | | | | | | | | | X | | | | |
| VIDEO/OPTICAL | X | | | | | X | | | | | | | X | | |
| ACDS | | | | | | | | | | | | | | | |
| CEC | | | | | | | | | | | | | | | |
| JMCIS | | | | | | | | | | | | | | | |
| DOLPHIN | | X | | X | | X | X | | X | X | X | X | X | X | |
| SMALL BOATS (4) | | X | | X | | X | X | | | | | | X | X | |
| IFF | | | | | | | | | | | | | | | |
| MK 92 GFCS | | | | | | | | | | | | | | | |
| CAS/STIR | | | | | | | | | X | X | | | | | |
| IR Mk-46 | | | | | | | X | | | | | X | | | |
| SQQ-89 | | | | | | | | | | | | | | | |
| Mk-309 ASWFC | | | | | | | | | | | | | | | |
| VOICE COMMS | | | | | | | | | | | | | | | |
| GPS | | | | | | | | | | | | | | | |
| TACAN | | | | | | | | | | | | | | | |
| RING INFO. NETWORK | | | | | | | | | | | | | | | |
| WCS | | | | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | | | | |
| 76 MM | | | | | | | | | | | | | | | |
| CIWS (1) | | | | | | | | | | | | | | | |
| Mk 49 (RAM LNCHR) | | | | | | | | | | | | | | | |
| RAM | | | | | | | | | | | | | | | |
| SVTT | | | | | | | | | | | | | | | |
| MK 50 | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | |
| BUOY EQUIP | | | | | | | | | | | | | | | |
| EOD TEAM | | | X | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| Requirements | | | | | | | | | | | | | | | |
| A1 | | | | | | | | | | | | | | | |
| A2 | X | | | | | | | | X | X | X | X | X | X | |
| A3 | | | | | | | | | | | | | | | |
| A4 | | | | | | | | | X | X | X | X | X | X | |
| A5 | | X | | | | | | | | | | | | X | |
| A6 | | X | | | | | | | | | | | | X | |
| A7 | | | | | | | | | | | | | | | |
| A8 | | | | | | | | | X | X | X | X | X | X | |
| A9 | | | | | | | | | | | | | | | |
| A10 | X | X | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| C1 | | | | | | | | | X | X | X | X | X | X | |
| C2 | | | | | | | | | X | X | X | X | X | X | |
| C3 | | | | | | | | | X | X | X | X | X | X | |
| C4 | X | X | X | | | | | | | | | | | | |
| C5 | | | | | | | | | | | | | | | |
| C6 | | | | | | | | | | | | | | | |
| C7 | | | | | | | | | | | | | | | |
| C8 | | | | | | | | | X | X | X | X | X | X | |

| Elements | SAR | | | | | | | OTW | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coast Guard Option 1 | Vol. Search | Surf Search | ESM | IR | Visual | Organic | Inorganic | Vol. Search | Surf Search | ESM | IR | Visual | Organic | Inorganic |
| SPY-1D | X | X | | | | | | X | X | | | | | |
| SPS-67 | X | X | | | | | | X | X | | | | | |
| TAS | | | | | | | | | | | | | | |
| SQS-56 | | | | | | | | | | | | | | |
| SH-100 | | | | | | | | | | | | | | |
| SLQ-32 | | | X | | | | | | | X | | | | |
| VIDEO/OPTICAL | | | | | X | | | | | | | X | | |
| ACDS | | | | | | | | | | | | | | |
| CEC | | | | | | | | | | | | | | |
| JMCIS | | | | | | | | | | | | | | |
| DOLPHIN | X | X | X | X | X | X | | X | X | X | X | X | X | |
| SMALL BOATS (4) | | | | | X | X | | | | | | X | X | |
| IFF | | | | | | | | | | | | | | |
| MK 92 GFCS | | | | | | | | | | | | | | |
| CAS/STIR | X | X | | | | | | X | X | | | | | |
| IR Mk-46 | | | | X | | | | | | | X | | | |
| SQQ-89 | | | | | | | | | | | | | | |
| Mk-309 ASWFC | | | | | | | | | | | | | | |
| VOICE COMMS | | | | | | | | | | | | | | |
| GPS | | | | | | | | | | | | | | |
| TACAN | | | | | | | | | | | | | | |
| RING INFO. NETWORK | | | | | | | | | | | | | | |
| WCS | | | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | | | |
| 76 MM | | | | | | | | | | | | | | |
| CIWS (1) | | | | | | | | | | | | | | |
| Mk 49 (RAM LNCHR) | | | | | | | | | | | | | | |
| RAM | | | | | | | | | | | | | | |
| SVTT | | | | | | | | | | | | | | |
| MK 50 | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | |
| BUOY EQUIP | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| Requirements | | | | | | | | | | | | | | |
| A1 | | | | | | | | | | | | | | |
| A2 | X | X | X | X | X | X | | X | X | X | X | X | X | |
| A3 | | | | | | | | | | | | | | |
| A4 | | | | | | | | | | | | | | |
| A5 | | | | | | X | | | | | | | X | |
| A6 | | | | | | X | | | | | | | X | |
| A7 | X | X | X | X | X | X | | X | X | X | X | X | X | |
| A8 | | | | | | | | | | | | | | |
| A9 | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| C1 | | | | | | | | | | | | | | |
| C2 | | | | | | | | | | | | | | |
| C3 | | | | | | | | | | | | | | |
| C4 | | | | | | | | | | | | | | |
| C5 | | | | | | | | | | | | | | |
| C6 | | | | | | | | | | | | | | |
| C7 | | | | | | | | | | | | | | |
| C8 | | | | | | | | | | | | | | |

Table F-10: Functional Allocation - Detection (Coast Guard option 1)

| Elements | AAW | | | | | | | | ASW | | | | | | | | ASUW | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coast Guard Option 1 | Voice Comm | Display | Identify | Threat Eval. | Track | Correlate | Weapons Assg | Command | Voice Comm | Display | Identify | Threat Eval. | Track | Correlate | Weapons Assg | Command | Voice Comm | Display | Identify | Threat Eval. | Track | Correlate | Weapons Assg | Command |
| SPY-1D | | | | | | | | | | | | | | | | | | | | | | | | |
| SPS-67 | | | | | | | | | | | | | | | | | | | | | | | | |
| TAS | | | | | | | | | | | | | | | | | | | | | | | | |
| SQS-56 | | | | | | | | | | X | X | X | X | X | | | | | | | X | X | | |
| SH-100 | | | | | | | | | | | | | | | | | | | | | | | | |
| SLQ-32 | | X | X | X | | X | X | | | | X | X | | X | | | | X | X | X | | X | | |
| VIDEO/OPTICAL | | | X | | | X | | | | | X | X | | X | | | | X | X | X | | X | | |
| ACDS | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X |
| CEC | | | | X | X | X | X | X | | | | | | | | | | | | | | | | |
| JMCIS | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X |
| DOLPHIN | | | X | X | | X | | | X | | X | X | X | X | | | | | X | X | X | X | | |
| SMALL BOATS (4) | | | | | | | | | | | | | | | | | | | X | X | X | X | | |
| IFF | | | X | X | | X | | | | | | | | | | | | | X | X | | X | | |
| MK 92 GFCS | | X | | | X | X | X | | | | | | | | | | | X | | | X | X | X | |
| CAS/STIR | | | | | X | X | | | | | | | | | | | | | | | X | X | | |
| IR Mk-46 | | X | X | X | | X | | | | | | | | | | | | X | X | X | | X | | |
| SQQ-89 | | | | | | | | | | X | | X | X | | X | X | | | | | | | | |
| Mk-309 ASWFC | | | | | | | | | | X | | X | X | | X | X | | | | | | | | |
| VOICE COMMS | X | | | | | | X | X | X | | | | | | X | X | X | | | | | | X | X |
| GPS | | | | | | | | X | | | | | | | | X | | | | | | | | X |
| TACAN | | | | | | | | X | | | | | | | | X | | | | | | | | X |
| RING INFO. NETWORK | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X |
| WCS | | | | | | | X | X | | | | | | | X | X | | | | | | | X | X |
| ISDS | | | | | | X | X | X | | | | | | | | | | | | | | | | |
| 76 MM | | | | | | | | | | | | | | | | | | | | | | | | |
| CIWS (1) | | | | X | X | | X | X | | | | | | | | | | | | | | | | |
| Mk 49 (RAM LNCHR) | | | | | | | | | | | | | | | | | | | | | | | | |
| RAM | | | | | | | | | | | | | | | | | | | | | | | | |
| SVTT | | | | | | | | | | | | | | | | | | | | | | | | |
| MK 50 | | | | | | | | | | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | | | | | | | | | | |
| BUOY EQUIP | | | | | | | | | | | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| Requirements | | | | | | | | | | | | | | | | | | | | | | | | |
| A1 | X | X | | | | | | | | | | | | | | | X | X | | | | | | |
| A2 | | | | | | | | | | | | | | | | | | | | | | | | |
| A3 | X | | | | | | | | | | | | | | | | X | | | | | | | |
| A4 | | | | | | | | | | | | | | | | | X | X | X | X | X | X | X | X |
| A5 | | | | | | | | | | | | | | | | | | | | | | | | |
| A6 | | | | | | | | | | | | | | | | | | | | | | | | |
| A7 | | | | | | | | | | | | | | | | | | | | | | | | |
| A8 | | | | | | | | | | | | | | | | | | | | | | | | |
| A9 | | | | | | | | | | | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| C1 | | X | X | X | X | X | X | X | | | | | | | | | | X | X | X | X | X | X | X |
| C2 | | X | X | X | X | X | X | X | | | | | | | | | | X | X | X | X | X | X | X |
| C3 | X | X | X | X | X | X | X | X | | | | | | | | | X | X | X | X | X | X | X | X |
| C4 | | | | | | | | | | | | | | | | | | | | | | | | |
| C5 | | | | | | | | | | | | | | | | | | | | | | | | |
| C6 | | | | | | | | | | | | | | | | | | | | | | | | |
| C7 | | | | | | | | | | | | | | | | | | | | | | | | |
| C8 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |

| Elements | MIW | | | | | | | STW | | | | AMW | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coast Guard Option 1 | Voice Comms | Display | Identify | Threat Eval. | Track | Correlate | Command | Voice Comms | Display | Identify | Command | Voice Comms | Display | Identify | Threat Eval. | Track | Correlate | Weapons Assg | Command |
| SPY-1D | | | | | | | | | | | | | | | | | | | |
| SPS-67 | | | | | | | | | | | | | | | | | | | |
| TAS | | | | | | | | | | | | | | | | | | | |
| SQS-56 | | | | | | | | | | | | | | | | | | | |
| SH-100 | | X | X | X | X | X | | | | | | | | | | | | | |
| SLQ-32 | | | | | | | | | | | | | | | | | | | |
| VIDEO/OPTICAL | | | X | X | | | | | | X | | | X | X | X | | | | |
| ACDS | | X | X | X | X | X | X | | X | X | X | | X | X | X | X | X | | |
| CEC | | | | | | | | | | | | | | | | | | | |
| JMCIS | | X | X | X | X | X | X | | X | X | X | | X | X | X | X | X | | |
| DOLPHIN | | | X | X | X | X | | | | | | | | | | | | | |
| SMALL BOATS (4) | | | X | X | X | X | | | | | | | | | | | | | |
| IFF | | | | | | | | | | | | | | | | | | | |
| MK 92 GFCS | | | | | | | | | | | | | | | | | | | |
| CAS/STIR | | | | | | | | | | | | | | | | | | | |
| IR Mk-46 | | | | | | | | | | | | | | | | | | | |
| SQQ-89 | | | | | | | | | | | | | | | | | | | |
| Mk-309 ASWFC | | | | | | | | | | | | | | | | | | | |
| VOICE COMMS | X | | | | | | X | X | | | X | X | | | | | | | |
| GPS | | | | | | | X | | | | | | | | | | | | |
| TACAN | | | | | | | X | | | | | | | | | | | | |
| RING INFO. NETWORK | | X | X | X | X | X | X | | X | | X | | X | X | X | X | X | | |
| WCS | | | | | | | | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | | | | | | | | |
| 76 MM | | | | | | | | | | | | | | | | | | | |
| CIWS (1) | | | | | | | | | | | | | | | | | | | |
| Mk 49 (RAM LNCHR) | | | | | | | | | | | | | | | | | | | |
| RAM | | | | | | | | | | | | | | | | | | | |
| SVTT | | | | | | | | | | | | | | | | | | | |
| MK 50 | | | | | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | | | | | |
| BUOY EQUIP | | | | | | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| Requirements | | | | | | | | | | | | | | | | | | | |
| A1 | X | X | | | | | | | | | | | | | | | | | |
| A2 | | | | | | | | | | | | | | | | | | | |
| A3 | X | | | | | | | | | | | | | | | | | | |
| A4 | | | | | | | | | | | | | | | | | | | |
| A5 | | | | | | | | | | | | | | | | | | | |
| A6 | | | | | | | | | | | | | | | | | | | |
| A7 | | | | | | | | | | | | | | | | | | | |
| A8 | | | | | | | | | | | | | | | | | | | |
| A9 | | | | | | | | | | | | | | | | | | | |
| A10 | X | X | X | X | X | X | X | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| C1 | | | | | | | | | | | | | | | | | | | |
| C2 | | | | | | | | | | | | | | | | | | | |
| C3 | | | | | | | | | | | | | | | | | | | |
| C4 | X | X | X | X | X | X | X | | | | | | | | | | | | |
| C5 | | | | | | | | | | | | | | | | | | | |
| C6 | | | | | | | | | | | | | | | | | | | |
| C7 | | | | | | | | | | | | | | | | | | | |
| C8 | X | X | X | X | X | X | X | | | | | | | | | | | | |

| Elements | ELT | | | | | | | | SAR | | | | | | OTW | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coast Guard Option 1 | Voice Comm | Display | Identify | Threat Eval. | Track | Correlate | Weapons Assg | Command | Voice Comm | Display | Identify | Track | Correlate | Command | Voice Comm | Identify | Display | Command |
| SPY-1D | | | | | | | | | | | | | | | | | | |
| SPS-67 | | | | | | | | | | | | | | | | | | |
| TAS | | | | | | | | | | | | | | | | | | |
| SQS-56 | | | | | X | X | | | | | | X | X | | | | | |
| SH-100 | | | | | | | | | | | | | | | | | | |
| SLQ-32 | | X | X | X | | X | | | | X | X | | X | | | | | |
| VIDEO/OPTICAL | | X | X | X | X | X | | | | | X | X | X | | | | | |
| ACDS | | X | X | X | X | X | X | X | | X | X | X | X | X | | X | X | X |
| CEC | | | | | | | | | | | | | | | | | | |
| JMCIS | | X | X | X | X | X | X | X | | X | X | X | X | X | | X | X | X |
| DOLPHIN | | | X | X | X | X | | | | | X | X | X | | | X | | |
| SMALL BOATS (4) | | | X | X | X | X | | | | | X | X | X | | | X | | |
| IFF | | | X | X | | X | | | | | X | | X | | | X | | |
| MK 92 GFCS | | X | | | X | X | X | | | X | | X | X | | | | X | |
| CAS/STIR | | | | | X | X | | | | | | X | X | | | | | |
| IR Mk-46 | | X | X | X | | X | | | | X | X | | X | | | X | | |
| SQQ-89 | | | | | | | | | | | | | | | | | | |
| Mk-309 ASWFC | | | | | | | | | | | | | | | | | | |
| VOICE COMMS | X | | | | | | X | X | X | | | | | X | X | X | X | X |
| GPS | | | | | | | | X | | | | | | X | | | | |
| TACAN | | | | | | | | X | | | | | | X | | | | |
| RING INFO. NETWORK | | X | X | X | X | X | X | X | | X | X | X | X | X | | X | X | X |
| WCS | | | | | | | X | X | | | | | | | | | | |
| ISDS | | | | | | | X | X | | | | | | | | | | |
| 76 MM | | | | | | | X | X | | | | | | | | | | |
| CIWS (1) | | | | | | | | | | | | | | | | | | |
| Mk 49 (RAM LNCHR) | | | | | | | | | | | | | | | | | | |
| RAM | | | | | | | | | | | | | | | | | | |
| SVTT | | | | | | | | | | | | | | | | | | |
| MK 50 | | | | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | | | | |
| BUOY EQUIP | | | | | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| Requirements | | | | | | | | | | | | | | | | | | |
| A1 | X | X | | | | | | | X | X | | | | | X | | X | |
| A2 | | | | | | | | | | | | | | | | | | |
| A3 | X | | | | | | | | | | | | | | X | | | |
| A4 | X | X | X | X | X | X | X | X | | | | | | | | | | |
| A5 | | | | | | | | | | | | | | | | | | |
| A6 | | | | | | | | | | | | | | | | | | |
| A7 | | | | | | | | | X | X | X | X | X | X | X | X | X | X |
| A8 | | | | | | | | | | | | | | | | | | |
| A9 | | | | | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| C1 | | X | X | X | X | X | X | X | | X | X | X | X | X | | | | |
| C2 | | X | X | X | X | X | X | X | | X | X | X | X | X | | | | |
| C3 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | |
| C4 | | | | | | | | | | | | | | | | | | |
| C5 | | | | | | | | | | | | | | | | | | |
| C6 | | | | | | | | | | | | | | | | | | |
| C7 | | | | | | | | | | | | | | | | | | |
| C8 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | |

**Table F-11: Functional Allocation - Control (Coast Guard option 1)**

| Elements | AAW | | | | | ASW | | | ASUW | | | | | MIW | | STW | | AMW | | | | ELT | | | | | | | SAR | | | OTW | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coast Guard Option 1 | Illumination | Weapon Delivery | Guidance | Soft Kill | Kill Eval. | Weapon Delivery | Soft Kill | Kill Eval. | Illumination | Weapon Delivery | Guidance | Soft Kill | Kill Eval. | Mark | Clear | Weapon Delivery | Kill Eval. | Illumination | Weapon Delivery | Guidance | Kill Eval. | Intercept | Board | Illumination | Weapon Delivery | Guidance | Soft Kill | Kill Eval. | Platform Delivery | Evaluation | Facilities (Med. et | Platform Delivery | Evaluation | Facilities (Med. et |
| SPY-1D | | | | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | |
| SPS-67 | | | | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | |
| TAS | X | | | | X | | | | | | | | X | | | | | | | | | | | X | | | | X | | | | | | |
| SQS-56 | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SH-100 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLQ-32 | | | | X | X | | | | | | | X | X | | | | | | | | | | | | | | X | X | | | | | | |
| VIDEO/OPTICAL | | | | | X | | | | | | | | X | | | | | | | | X | | | | | | | X | | X | | | X | |
| ACDS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CEC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| JMCIS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DOLPHIN | | | | | | X | | X | | | | | X | | | | | | | | X | X | X | | | | | X | X | X | | X | X | |
| SMALL BOATS (4) | | | | | | | | | | | | | X | | | X | | | | | | X | X | | X | | | X | X | X | | X | X | |
| IFF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MK 92 GFCS | | | | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | |
| CAS/STIR | X | | | | | | | | X | | | | | | | | | X | | | | | | X | | | | | | | | | | |
| IR Mk-46 | | | | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | |
| SQQ-89 | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mk-309 ASWFC | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VOICE COMMS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GPS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TACAN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RING INFO. NETWORK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WCS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 76 MM | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | | | | |
| CIWS (1) | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mk 49 (RAM LNCHR) | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RAM | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SVTT | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MK 50 | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SRBOC | | | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | | |
| NIXIE | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BUOY EQUIP | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | X | | |
| EOD TEAM | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | X | | | X |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Requirements | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A4 | | | | | | | | | X | X | | X | | | | | | | | | | X | X | X | X | X | X | X | | | | | | |
| A5 | | | | | | X | | X | | | | | X | | | | | | | | X | X | X | | X | | | X | X | X | | X | X | |
| A6 | | | | | | | | | | | | | X | | | X | | | | | | X | X | | X | | | X | X | X | | X | X | |
| A7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | X | X | X | X |
| A8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A9 | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | X | | | X |
| A11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X |
| A13 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C1 | X | X | | X | X | X | X | X | X | X | | X | X | | | | | | | | | X | X | X | X | X | X | X | | | | | | |
| C2 | X | X | | X | X | X | X | X | X | X | | X | X | | | | | | | | | | | X | X | X | X | X | | | | | | |
| C3 | X | X | | X | X | X | X | X | X | X | | X | X | | | | | | | | | | | X | X | X | X | X | | | | | | |
| C4 | | | | | | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | |
| C5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | | |
| C6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | |
| C7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X |
| C8 | X | X | | X | X | X | X | X | X | X | | X | X | X | X | | | | | | | | X | X | X | X | X | X | X | X | X | X | X | X |

Table F-12: Functional Allocation - Engagement (Coast Guard option 1)

| Elements | AAW | | | | | | ASW | | | | ASUW | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coast Guard Option 2 | Vol Search | ESM | IR | Visual | Organic | Inorganic | Active | Passive | Organic | Inorganic | Surf Search | ESM | IR | Visual | Organic | Inorganic |
| XPAR | X | | | | | | | | | | X | | | | | |
| SPS-67 | X | | | | | | | | | | X | | | | | |
| TAS | X | | | | | | | | | | X | | | | | |
| SH-100 | | | | | | | | | | | | | | | | |
| SLQ-32 | | X | | | | | | | | | | X | | | | |
| VIDEO/OPTICAL | | | | X | | | | X | | | | | | X | | |
| ACDS | | | | | | | | | | | | | | | | |
| CEC | | | | | | | | | | | | | | | | |
| JMCIS | | | | | | | | | | | | | | | | |
| DOLPHIN | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| SMALL BOATS (4) | | | | | | | | | X | | | | | X | X | |
| IFF | | | | | | | | | | | | | | | | |
| GFCS | | | | | | | | | | | | | | | | |
| GFCS RADAR | X | | | | | | | | | | X | | | | | |
| IR Mk-46 | | | X | | | | | | | | | | X | | | |
| VOICE COMMS | | | | | | | | | | | | | | | | |
| GPS | | | | | | | | | | | | | | | | |
| TACAN | | | | | | | | | | | | | | | | |
| RING INFO. NETWORK | | | | | | | | | | | | | | | | |
| WCS | | | | | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | | | | | |
| 40 MM GUNS (2) | | | | | | | | | | | | | | | | |
| Mk 49 (RAM LNCHR) | | | | | | | | | | | | | | | | |
| RAM | | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | | |
| BUOY EQUIP | | | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| Requirements | | | | | | | | | | | | | | | | |
| A1 | | | | | | | | | | | | | | | | |
| A2 | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| A3 | | | | | | | | | | | | | | | | |
| A4 | | | | | | | | | | | X | X | X | X | X | |
| A5 | | | | | X | | | | X | | | | | | | |
| A6 | | | | | X | | | | X | | | | | | | |
| A7 | | | | | | | | | | | | | | | | |
| A8 | X | X | X | X | X | | | | | | X | X | X | X | X | |
| A9 | | | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| C1 | X | X | X | X | X | | | | | | X | X | X | X | X | |
| C2 | X | X | X | X | X | | | | | | X | X | X | X | X | |
| C3 | X | X | X | X | X | | X | X | X | | X | X | X | X | X | |
| C4 | | | | | | | | | | | | | | | | |
| C5 | | | | | | | | | | | | | | | | |
| C6 | | | | | | | | | | | | | | | | |
| C7 | | | | | | | | | | | | | | | | |
| C8 | X | X | X | X | X | | | | | | X | X | X | X | X | |

| Elements | MIW | | | STW | | AMW | | |
|---|---|---|---|---|---|---|---|---|
| Coast Guard Option 2 | Ship Board | Organic | Inorganic | Organic | Inorganic | Visual | Organic | Inorganic |
| XPAR | | | | | | | | |
| SPS-67 | | | | | | | | |
| TAS | | | | | | | | |
| SH-100 | X | | | | | | | |
| SLQ-32 | | | | | | | | |
| VIDEO/OPTICAL | X | | | | | X | | |
| ACDS | | | | | | | | |
| CEC | | | | | | | | |
| JMCIS | | | | | | | | |
| DOLPHIN | | X | | X | | X | X | |
| SMALL BOATS (4) | | X | | X | | X | X | |
| IFF | | | | | | | | |
| GFCS | | | | | | | | |
| GFCS RADAR | | | | | | | | |
| IR Mk-46 | | | | | | | X | |
| VOICE COMMS | | | | | | | | |
| GPS | | | | | | | | |
| TACAN | | | | | | | | |
| RING INFO. NETWORK | | | | | | | | |
| WCS | | | | | | | | |
| ISDS | | | | | | | | |
| 40 MM GUNS (2) | | | | | | | | |
| Mk 49 (RAM LNCHR) | | | | | | | | |
| RAM | | | | | | | | |
| SRBOC | | | | | | | | |
| NIXIE | | | | | | | | |
| BUOY EQUIP | | | | | | | | |
| EOD TEAM | | | X | | | | | |
| | | | | | | | | |
| Requirements | | | | | | | | |
| A1 | | | | | | | | |
| A2 | X | | | | | | | |
| A3 | | | | | | | | |
| A4 | | | | | | | | |
| A5 | | X | | | | | | |
| A6 | | X | | | | | | |
| A7 | | | | | | | | |
| A8 | | | | | | | | |
| A9 | | | | | | | | |
| A10 | X | X | | | | | | |
| A11 | | | | | | | | |
| A12 | | | | | | | | |
| A13 | | | | | | | | |
| | | | | | | | | |
| C1 | | | | | | | | |
| C2 | | | | | | | | |
| C3 | | | | | | | | |
| C4 | X | X | X | | | | | |
| C5 | | | | | | | | |
| C6 | | | | | | | | |
| C7 | | | | | | | | |
| C8 | | | | | | | | |

| Elements | ELT | | | | | | | SAR | | | | | | | OTW | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coast Guard Option 2 | Vol. Search | Surf Search | ESM | IR | Visual | Organic | Inorganic | Vol. Search | Surf Search | ESM | IR | Visual | Organic | Inorganic | Vol. Search | Surf Search | ESM | IR | Visual | Organic | Inorganic |
| XPAR | X | X | | | | | | X | X | | | | | | X | X | | | | | |
| SPS-67 | X | X | | | | | | X | X | | | | | | X | X | | | | | |
| TAS | | | | | | | | | | | | | | | | | | | | | |
| SH-100 | | | | | | | | | | | | | | | | | | | | | |
| SLQ-32 | | | X | | | | | | | X | | | | | | | X | | | | |
| VIDEO/OPTICAL | | | | | X | | | | | | | X | | | | | | | X | | |
| ACDS | | | | | | | | | | | | | | | | | | | | | |
| CEC | | | | | | | | | | | | | | | | | | | | | |
| JMCIS | | | | | | | | | | | | | | | | | | | | | |
| DOLPHIN | X | X | X | X | X | X | | X | X | X | X | X | X | | X | X | X | X | X | X | |
| SMALL BOATS (4) | | | | | X | X | | | | | | X | X | | | | | | X | X | |
| IFF | | | | | | | | | | | | | | | | | | | | | |
| GFCS | | | | | | | | | | | | | | | | | | | | | |
| GFCS RADAR | X | X | | | | | | X | X | | | | | | X | X | | | | | |
| IR Mk-46 | | | | X | | | | | | | X | | | | | | | X | | | |
| VOICE COMMS | | | | | | | | | | | | | | | | | | | | | |
| GPS | | | | | | | | | | | | | | | | | | | | | |
| TACAN | | | | | | | | | | | | | | | | | | | | | |
| RING INFO. NETWORK | | | | | | | | | | | | | | | | | | | | | |
| WCS | | | | | | | | | | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | | | | | | | | | | |
| 40 MM GUNS (2) | | | | | | | | | | | | | | | | | | | | | |
| Mk 49 (RAM LNCHR) | | | | | | | | | | | | | | | | | | | | | |
| RAM | | | | | | | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | | | | | | | |
| BUOY EQUIP | | | | | | | | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| Requirements | | | | | | | | | | | | | | | | | | | | | |
| A1 | | | | | | | | | | | | | | | | | | | | | |
| A2 | X | X | X | X | X | X | | X | X | X | X | X | X | | X | X | X | X | X | X | |
| A3 | | | | | | | | | | | | | | | | | | | | | |
| A4 | X | X | X | X | X | X | | | | | | | | | | | | | | | |
| A5 | | | | | | X | | | | | | | X | | | | | | | X | |
| A6 | | | | | | X | | | | | | | X | | | | | | | X | |
| A7 | | | | | | | | X | X | X | X | X | X | | X | X | X | X | X | X | |
| A8 | X | X | X | X | X | X | | | | | | | | | | | | | | | |
| A9 | | | | | | | | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| C1 | X | X | X | X | X | X | | | | | | | | | | | | | | | |
| C2 | X | X | X | X | X | X | | | | | | | | | | | | | | | |
| C3 | X | X | X | X | X | X | | | | | | | | | | | | | | | |
| C4 | | | | | | | | | | | | | | | | | | | | | |
| C5 | | | | | | | | | | | | | | | | | | | | | |
| C6 | | | | | | | | | | | | | | | | | | | | | |
| C7 | | | | | | | | | | | | | | | | | | | | | |
| C8 | X | X | X | X | X | X | | | | | | | | | | | | | | | |

Table F-13: Functional Allocation - Detection (Coast Guard option 2)

| Coast Guard Option 2 | AAW Voice Comm | AAW Display | AAW Identify | AAW Threat Eval. | AAW Track | AAW Correlate | AAW Weapons Assg | AAW Command | ASW Voice Comm | ASW Display | ASW Identify | ASW Threat Eval. | ASW Track | ASW Correlate | ASW Weapons Assg | ASW Command | ASUW Voice Comm. | ASUW Display | ASUW Identify | ASUW Threat Eval. | ASUW Track | ASUW Correlate | ASUW Weapons Assg | ASUW Command |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| XPAR | | | | | | | | | | | | | | | | | | | | | | | | |
| SPS-67 | | | | | | | | | | | | | | | | | | | | | | | | |
| TAS | | | | | | | | | | | | | | | | | | | | | | | | |
| SH-100 | | | | | | | | | | | | | | | | | | | | | | | | |
| SLQ-32 | | X | X | X | | X | X | | | | X | X | | X | | | | X | X | X | | X | | |
| VIDEO/OPTICAL | | | X | | | X | | | | | X | X | | X | | | | X | X | X | | X | | |
| ACDS | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X |
| CEC | | | | X | X | X | X | X | | | | | | | | | | | | | | | | |
| JMCIS | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X |
| DOLPHIN | | | X | X | | X | | | X | | X | X | X | X | | | | | X | X | X | X | | |
| SMALL BOATS (4) | | | | | | | | | | | | | | | | | | | X | X | X | X | | |
| IFF | | | X | X | | X | | | | | | | | | | | | | X | X | | X | | |
| GFCS | | X | | | X | X | X | | | | | | | | | | | X | | | X | X | X | |
| GFCS RADAR | | | | | X | X | | | | | | | | | | | | | | | X | X | | |
| IR Mk-46 | | X | X | X | | X | | | | | | | | | | | | X | X | X | | X | | |
| VOICE COMMS | X | | | | | | X | X | X | | | | | | X | X | X | | | | | | X | X |
| GPS | | | | | | | | X | | | | | | | | X | | | | | | | | X |
| TACAN | | | | | | | | X | | | | | | | | X | | | | | | | | X |
| RING INFO. NETWORK | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X |
| WCS | | | | | | | X | X | | | | | | | X | X | | | | | | | X | X |
| ISDS | | | | | | X | X | X | | | | | | | | | | | | | | | | |
| 40 MM GUNS (2) | | | | X | X | | X | X | | | | | | | | | | | | | | | | |
| Mk 49 (RAM LNCHR) | | | | | | | | | | | | | | | | | | | | | | | | |
| RAM | | | | | | | | | | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | | | | | | | | | | |
| BUOY EQUIP | | | | | | | | | | | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| Requirements | | | | | | | | | | | | | | | | | | | | | | | | |
| A1 | X | X | | | | | | | | | | | | | | | X | X | | | | | | |
| A2 | | | | | | | | | | | | | | | | | | | | | | | | |
| A3 | X | | | | | | | | | | | | | | | | X | | | | | | | |
| A4 | | | | | | | | | | | | | | | | | X | X | X | X | X | X | X | X |
| A5 | | | | | | | | | | | | | | | | | | | | | | | | |
| A6 | | | | | | | | | | | | | | | | | | | | | | | | |
| A7 | | | | | | | | | | | | | | | | | | | | | | | | |
| A8 | | | | | | | | | | | | | | | | | | | | | | | | |
| A9 | | | | | | | | | | | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| C1 | | X | X | X | X | X | X | X | | | | | | | | | | X | X | X | X | X | X | X |
| C2 | | X | X | X | X | X | X | X | | | | | | | | | | X | X | X | X | X | X | X |
| C3 | X | X | X | X | X | X | X | X | | | | | | | | | X | X | X | X | X | X | X | X |
| C4 | | | | | | | | | | | | | | | | | | | | | | | | |
| C5 | | | | | | | | | | | | | | | | | | | | | | | | |
| C6 | | | | | | | | | | | | | | | | | | | | | | | | |
| C7 | | | | | | | | | | | | | | | | | | | | | | | | |
| C8 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |

| Coast Guard Option 2 | MIW Voice Comms | MIW Display | MIW Identify | MIW Threat Eval. | MIW Track | MIW Correlate | MIW Command | STW Voice Comms | STW Display | STW Identify | STW Command | AMW Voice Comms | AMW Display | AMW Identify | AMW Threat Eval. | AMW Track | AMW Correlate | AMW Weapons Assg | AMW Command |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| XPAR | | | | | | | | | | | | | | | | | | | |
| SPS-67 | | | | | | | | | | | | | | | | | | | |
| TAS | | | | | | | | | | | | | | | | | | | |
| SH-100 | | X | X | X | X | X | | | | | | | | | | | | | |
| SLQ-32 | | | | | | | | | | | | | | | | | | | |
| VIDEO/OPTICAL | | | X | X | | | | | | X | | | X | X | X | | | | |
| ACDS | | X | X | X | X | X | X | | X | X | X | | X | X | X | X | X | | |
| CEC | | | | | | | | | | | | | | | | | | | |
| JMCIS | | X | X | X | X | X | X | | X | X | X | | X | X | X | X | X | | |
| DOLPHIN | | | X | X | X | X | | | | | | | | | | | | | |
| SMALL BOATS (4) | | | X | X | X | X | | | | | | | | | | | | | |
| IFF | | | | | | | | | | | | | | | | | | | |
| GFCS | | | | | | | | | | | | | | | | | | | |
| GFCS RADAR | | | | | | | | | | | | | | | | | | | |
| IR Mk-46 | | | | | | | | | | | | | | | | | | | |
| VOICE COMMS | X | | | | | | X | X | | | X | X | | | | | | | |
| GPS | | | | | | | X | | | | | | | | | | | | |
| TACAN | | | | | | | X | | | | | | | | | | | | |
| RING INFO. NETWORK | | X | X | X | X | X | X | | X | | X | | X | X | X | X | X | | |
| WCS | | | | | | | | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | | | | | | | | |
| 40 MM GUNS (2) | | | | | | | | | | | | | | | | | | | |
| Mk 49 (RAM LNCHR) | | | | | | | | | | | | | | | | | | | |
| RAM | | | | | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | | | | | |
| BUOY EQUIP | | | | | | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| Requirements | | | | | | | | | | | | | | | | | | | |
| A1 | X | X | | | | | | | | | | | | | | | | | |
| A2 | | | | | | | | | | | | | | | | | | | |
| A3 | X | | | | | | | | | | | | | | | | | | |
| A4 | | | | | | | | | | | | | | | | | | | |
| A5 | | | | | | | | | | | | | | | | | | | |
| A6 | | | | | | | | | | | | | | | | | | | |
| A7 | | | | | | | | | | | | | | | | | | | |
| A8 | | | | | | | | | | | | | | | | | | | |
| A9 | | | | | | | | | | | | | | | | | | | |
| A10 | X | X | X | X | X | X | X | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| C1 | | | | | | | | | | | | | | | | | | | |
| C2 | | | | | | | | | | | | | | | | | | | |
| C3 | | | | | | | | | | | | | | | | | | | |
| C4 | X | X | X | X | X | X | X | | | | | | | | | | | | |
| C5 | | | | | | | | | | | | | | | | | | | |
| C6 | | | | | | | | | | | | | | | | | | | |
| C7 | | | | | | | | | | | | | | | | | | | |
| C8 | X | X | X | X | X | X | X | | | | | | | | | | | | |

| Coast Guard Option 2 | ELT Voice Comm | ELT Display | ELT Identify | ELT Threat Eval. | ELT Track | ELT Correlate | ELT Weapons Assg | ELT Command | SAR Voice Comm | SAR Display | SAR Identify | SAR Track | SAR Correlate | SAR Command | OTW Voice Comm. | OTW Identify | OTW Display | OTW Command |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| XPAR | | | | | | | | | | | | | | | | | | |
| SPS-67 | | | | | | | | | | | | | | | | | | |
| TAS | | | | | | | | | | | | | | | | | | |
| SH-100 | | | | | | | | | | | | | | | | | | |
| SLQ-32 | | X | X | X | | X | | | | X | X | | X | | | | | |
| VIDEO/OPTICAL | | X | X | X | X | X | | | | | X | X | X | | | | | |
| ACDS | | X | X | X | X | X | X | X | | X | X | X | X | X | | X | X | X |
| CEC | | | | | | | | | | | | | | | | | | |
| JMCIS | | X | X | X | X | X | X | X | | X | X | X | X | X | | X | X | X |
| DOLPHIN | | | X | X | X | X | | | | | X | X | X | | | X | | |
| SMALL BOATS (4) | | | X | X | X | X | | | | | X | X | X | | | X | | |
| IFF | | | X | X | | X | | | | | X | | X | | | X | | |
| GFCS | | X | | | X | X | X | | | X | | X | X | | | | X | |
| GFCS RADAR | | | | | X | X | | | | | | X | X | | | | | |
| IR Mk-46 | | X | X | X | | X | | | | X | X | | X | | | X | | |
| VOICE COMMS | X | | | | | | X | X | X | | | | | X | X | X | X | X |
| GPS | | | | | | | | X | | | | | | X | | | | |
| TACAN | | | | | | | | X | | | | | | X | | | | |
| RING INFO. NETWORK | | X | X | X | X | X | X | X | | X | X | X | X | X | | X | X | X |
| WCS | | | | | | | X | X | | | | | | | | | | |
| ISDS | | | | | | | X | X | | | | | | | | | | |
| 40 MM GUNS (2) | | | | | | | | | | | | | | | | | | |
| Mk 49 (RAM LNCHR) | | | | | | | | | | | | | | | | | | |
| RAM | | | | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | | | | |
| BUOY EQUIP | | | | | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| Requirements | | | | | | | | | | | | | | | | | | |
| A1 | X | X | | | | | | | X | X | | | | | X | | X | |
| A2 | | | | | | | | | | | | | | | | | | |
| A3 | X | | | | | | | | | | | | | | X | | | |
| A4 | X | X | X | X | X | X | X | X | | | | | | | | | | |
| A5 | | | | | | | | | | | | | | | | | | |
| A6 | | | | | | | | | | | | | | | | | | |
| A7 | | | | | | | | | X | X | X | X | X | X | X | X | X | X |
| A8 | | | | | | | | | | | | | | | | | | |
| A9 | | | | | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| C1 | | X | X | X | X | X | X | X | | X | X | X | X | X | | | | |
| C2 | | X | X | X | X | X | X | X | | X | X | X | X | X | | | | |
| C3 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | |
| C4 | | | | | | | | | | | | | | | | | | |
| C5 | | | | | | | | | | | | | | | | | | |
| C6 | | | | | | | | | | | | | | | | | | |
| C7 | | | | | | | | | | | | | | | | | | |
| C8 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | |

Table F-14: Functional Allocation - Control (Coast Guard option 2)

| Elements | AAW | | | | | ASW | | | ASUW | | | | | MIW | | STW | | AMW | | | | ELT | | | | | | | SAR | | | OTW | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coast Guard Option 2 | Illumination | Weapon Delivery | Guidance | Soft Kill | Kill Eval. | Weapon Delivery | Soft Kill | Kill Eval. | Illumination | Weapon Delivery | Guidance | Soft Kill | Kill Eval. | Mark | Clear | Weapon Delivery | Kill Eval. | Illumination | Weapon Delivery | Guidance | Kill Eval. | Intercept | Board | Illumination | Weapon Delivery | Guidance | Soft Kill | Kill Eval. | Platform Delivery | Evaluation | Facilities (Med. et | Platform Delivery | Evaluation | Facilities (Med. et |
| XPAR | | | | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | |
| SPS-67 | | | | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | |
| TAS | X | | | | X | | | | | | | | X | | | | | | | | | | | X | | | | X | | | | | | |
| SH-100 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLQ-32 | | | | X | X | | | | | | | X | X | | | | | | | | | | | | | | X | X | | | | | | |
| VIDEO/OPTICAL | | | | | X | | | | | | | | X | | | | | | | | X | | | | | | | X | | X | | | X | |
| ACDS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CEC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| JMCIS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DOLPHIN | | | | | | X | | X | | | | | X | | | | | | | | X | X | X | | | | | X | X | X | | X | X | |
| SMALL BOATS (4) | | | | | | | | | | | | | X | | | X | | | | | | X | X | | X | | | X | X | X | | X | X | |
| IFF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GFCS | | | | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | |
| GFCS RADAR | X | | | | | | | | X | | | | | | | | | X | | | | | | X | | | | | | | | | | |
| IR Mk-46 | | | | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | |
| VOICE COMMS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GPS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TACAN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RING INFO. NETWORK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WCS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 40 MM GUNS (2) | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | | | | |
| Mk 49 (RAM LNCHR) | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RAM | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SRBOC | | | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | | |
| NIXIE | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BUOY EQUIP | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | X | | |
| EOD TEAM | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | X | | | X |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Requirements | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A4 | | | | | | | | | X | X | | X | | | | | | | | | | X | X | X | X | X | X | X | | | | | | |
| A5 | | | | | | X | | X | | | | | X | | | | | | | | X | X | X | | X | | | X | X | X | | X | X | |
| A6 | | | | | | | | | | | | | X | | | X | | | | | | X | X | | X | | | X | X | X | | X | X | |
| A7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | X | X | X | X |
| A8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A9 | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | X | | | X |
| A11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X |
| A13 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C1 | X | X | | X | X | X | X | X | X | X | | X | X | | | | | | | | | X | X | X | X | X | X | X | | | | | | |
| C2 | X | X | | X | X | X | X | X | X | X | | X | X | | | | | | | | | | | X | X | X | X | X | | | | | | |
| C3 | X | X | | X | X | X | X | X | X | X | | X | X | | | | | | | | | | | X | X | X | X | X | | | | | | |
| C4 | | | | | | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | |
| C5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | | |
| C6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | |
| C7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X |
| C8 | X | X | | X | X | X | X | X | X | X | | X | X | X | X | | | | | | | | X | X | X | X | X | X | X | X | X | X | X | X |

Table F-15: Functonal Allocation - Engagement (Coast Guard option 2)

| Elements | AAW | | | | | | ASW | | | | ASUW | | | | | | MIW | | | STW | | AMW | | | ELT | | | | | | | SAR | | | | | | | OTW | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coast Guard Option 3 | Vol Search | ESM | IR | Visual | Organic | Inorganic | Active | Passive | Organic | Inorganic | Surf Search | ESM | IR | Visual | Organic | Inorganic | Ship Board | Organic | Inorganic | Organic | Inorganic | Visual | Organic | Inorganic | Vol. Search | Surf Search | ESM | IR | Visual | Organic | Inorganic | Vol. Search | Surf Search | ESM | IR | Visual | Organic | Inorganic | Vol. Search | Surf Search | ESM | IR | Visual | Organic | Inorganic |
| SPS-49 | X | | | | | | | | | | X | | | | | | | | | | | | | | X | X | | | | | | X | X | | | | | | X | X | | | | | |
| SPS-67 | X | | | | | | | | | | X | | | | | | | | | | | | | | X | X | | | | | | X | X | | | | | | X | X | | | | | |
| SUTEC DOUBLE EAGLE | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLQ-32 | | X | | | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | | X | | | | | | | X | | | | |
| VIDEO/OPTICAL | | | | X | | | | X | | | | | | X | | | X | | | | | X | | | | | | | X | | | | | | | X | | | | | | | X | | |
| ACDS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CEC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| JMCIS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DOLPHIN | X | X | X | X | X | | X | X | X | | X | X | X | X | X | | | X | | X | | X | X | | X | X | X | X | X | X | | X | X | X | X | X | X | | X | X | X | X | X | X | |
| SMALL BOATS (3) | | | | | | | | | X | | | | | X | X | | | X | | X | | X | X | | | | | | X | X | | | | | | X | X | | | | | | X | X | |
| IFF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GFCS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GFCS RADAR | X | | | | | | | | | | X | | | | | | | | | | | | | | X | X | | | | | | X | X | | | | | | X | X | | | | | |
| IR Mk-46 | | | X | | | | | | | | | | X | | | | | | | | | | X | | | | | X | | | | | | | X | | | | | | | X | | | |
| VOICE COMMS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GPS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TACAN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RING INFO. NETWORK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WCS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 40 MM GUN (1) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| STINGER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BUOY EQUIP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Requirements | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A2 | X | X | X | X | X | | X | X | X | | X | X | X | X | X | | X | | | | | | | | X | X | X | X | X | X | | X | X | X | X | X | X | | X | X | X | X | X | X | |
| A3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A4 | | | | | | | | | | | X | X | X | X | X | | | | | | | | | | X | X | X | X | X | X | | | | | | | | | | | | | | | |
| A5 | | | | | X | | | | X | | | | | | | | | X | | | | | | | | | | | | X | | | | | | | X | | | | | | | X | |
| A6 | | | | | X | | | | X | | | | | | | | | X | | | | | | | | | | | | X | | | | | | | X | | | | | | | X | |
| A7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | X | X | X | X | | X | X | X | X | X | X | |
| A8 | X | X | X | X | X | | | | | | X | X | X | X | X | | | | | | | | | | X | X | X | X | X | X | | | | | | | | | | | | | | | |
| A9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C1 | X | X | X | X | X | | | | | | X | X | X | X | X | | | | | | | | | | X | X | X | X | X | X | | | | | | | | | | | | | | | |
| C2 | X | X | X | X | X | | | | | | X | X | X | X | X | | | | | | | | | | X | X | X | X | X | X | | | | | | | | | | | | | | | |
| C3 | X | X | X | X | X | | X | X | X | | X | X | X | X | X | | | | | | | | | | X | X | X | X | X | X | | | | | | | | | | | | | | | |
| C4 | | | | | | | | | | | | | | | | | X | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C8 | X | X | X | X | X | | | | | | X | X | X | X | X | | | | | | | | | | X | X | X | X | X | X | | | | | | | | | | | | | | | |

Table F-16: Functional Allocation - Detection (Coast Guard option 3)

| Coast Guard Option 3 | AAW Voice Comm | AAW Display | AAW Identify | AAW Threat Eval. | AAW Track | AAW Correlate | AAW Weapons Assg | AAW Command | ASW Voice Comm | ASW Display | ASW Identify | ASW Threat Eval. | ASW Track | ASW Correlate | ASW Weapons Assg | ASW Command |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SPS-49 | | | | | | | | | | | | | | | | |
| SPS-67 | | | | | | | | | | | | | | | | |
| SUTEC DOUBLE EAGLE | | | | | | | | | | | | | | | | |
| SLQ-32 | | X | X | X | | X | X | | | | X | X | | X | | |
| VIDEO/OPTICAL | | | X | | | X | | | | | X | X | | X | | |
| ACDS | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X |
| CEC | | | | X | X | X | X | X | | | | | | | | |
| JMCIS | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X |
| DOLPHIN | | | X | X | | X | | | X | | X | X | X | X | | |
| SMALL BOATS (3) | | | | | | | | | | | | | | | | |
| IFF | | | X | X | | X | | | | | | | | | | |
| GFCS | | X | | | X | X | X | | | | | | | | | |
| GFCS RADAR | | | | | X | X | | | | | | | | | | |
| IR Mk-46 | | X | X | X | | X | | | | | | | | | | |
| VOICE COMMS | X | | | | | | X | X | X | | | | | | X | X |
| GPS | | | | | | | | X | | | | | | | | X |
| TACAN | | | | | | | | X | | | | | | | | X |
| RING INFO. NETWORK | | X | X | X | X | X | X | X | | X | X | X | X | X | X | X |
| WCS | | | | | | | X | X | | | | | | | X | X |
| ISDS | | | | | | X | X | X | | | | | | | | |
| 40 MM GUN (1) | | | | X | X | | X | X | | | | | | | | |
| STINGER | | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | | |
| BUOY EQUIP | | | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| Requirements | | | | | | | | | | | | | | | | |
| A1 | X | X | | | | | | | | | | | | | | |
| A2 | | | | | | | | | | | | | | | | |
| A3 | X | | | | | | | | | | | | | | | |
| A4 | | | | | | | | | | | | | | | | |
| A5 | | | | | | | | | | | | | | | | |
| A6 | | | | | | | | | | | | | | | | |
| A7 | | | | | | | | | | | | | | | | |
| A8 | | | | | | | | | | | | | | | | |
| A9 | | | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| C1 | | X | X | X | X | X | X | X | | | | | | | | |
| C2 | | X | X | X | X | X | X | X | | | | | | | | |
| C3 | X | X | X | X | X | X | X | X | | | | | | | | |
| C4 | | | | | | | | | | | | | | | | |
| C5 | | | | | | | | | | | | | | | | |
| C6 | | | | | | | | | | | | | | | | |
| C7 | | | | | | | | | | | | | | | | |
| C8 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |

| Coast Guard Option 3 | ASUW Voice Comm | ASUW Display | ASUW Identify | ASUW Threat Eval. | ASUW Track | ASUW Correlate | ASUW Weapons Assg | ASUW Command | MIW Voice Comms | MIW Display | MIW Identify | MIW Threat Eval. | MIW Track | MIW Correlate | MIW Command | STW Voice Comms | STW Display | STW Identify | STW Command |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SPS-49 | | | | | | | | | | | | | | | | | | | |
| SPS-67 | | | | | | | | | | | | | | | | | | | |
| SUTEC DOUBLE EAGLE | | | | | | | | | | X | X | X | X | X | | | | | |
| SLQ-32 | | X | X | X | | X | | | | | | | | | | | | | |
| VIDEO/OPTICAL | | X | X | X | | X | | | | | X | X | | | | | | X | |
| ACDS | | X | X | X | X | X | X | X | | X | X | X | X | X | X | | X | X | X |
| CEC | | | | | | | | | | | | | | | | | | | |
| JMCIS | | X | X | X | X | X | X | X | | X | X | X | X | X | X | | X | X | X |
| DOLPHIN | | | X | X | X | X | | | | | X | X | X | X | | | | | |
| SMALL BOATS (3) | | | X | X | X | X | | | | | X | X | X | X | | | | | |
| IFF | | | X | X | | X | | | | | | | | | | | | | |
| GFCS | | X | | | X | X | X | | | | | | | | | | | | |
| GFCS RADAR | | | | | X | X | | | | | | | | | | | | | |
| IR Mk-46 | | X | X | X | | X | | | | | | | | | | | | | |
| VOICE COMMS | X | | | | | | X | X | X | | | | | | X | X | | | X |
| GPS | | | | | | | | X | | | | | | | X | | | | |
| TACAN | | | | | | | | X | | | | | | | X | | | | |
| RING INFO. NETWORK | | X | X | X | X | X | X | X | | X | X | X | X | X | X | | X | | X |
| WCS | | | | | | | X | X | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | | | | | | | | |
| 40 MM GUN (1) | | | | | | | | | | | | | | | | | | | |
| STINGER | | | | | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | | | | | |
| BUOY EQUIP | | | | | | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| Requirements | | | | | | | | | | | | | | | | | | | |
| A1 | X | X | | | | | | | X | X | | | | | | | | | |
| A2 | | | | | | | | | | | | | | | | | | | |
| A3 | X | | | | | | | | X | | | | | | | | | | |
| A4 | X | X | X | X | X | X | X | X | | | | | | | | | | | |
| A5 | | | | | | | | | | | | | | | | | | | |
| A6 | | | | | | | | | | | | | | | | | | | |
| A7 | | | | | | | | | | | | | | | | | | | |
| A8 | | | | | | | | | | | | | | | | | | | |
| A9 | | | | | | | | | | | | | | | | | | | |
| A10 | | | | | | | | | X | X | X | X | X | X | X | | | | |
| A11 | | | | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| C1 | | X | X | X | X | X | X | X | | | | | | | | | | | |
| C2 | | X | X | X | X | X | X | X | | | | | | | | | | | |
| C3 | X | X | X | X | X | X | X | X | | | | | | | | | | | |
| C4 | | | | | | | | | X | X | X | X | X | X | X | | | | |
| C5 | | | | | | | | | | | | | | | | | | | |
| C6 | | | | | | | | | | | | | | | | | | | |
| C7 | | | | | | | | | | | | | | | | | | | |
| C8 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | |

| Coast Guard Option 3 | AMW Voice Comms | AMW Display | AMW Identify | AMW Threat Eval. | AMW Track | AMW Correlate | AMW Weapons Assg | AMW Command | ELT Voice Comm | ELT Display | ELT Identify | ELT Threat Eval. | ELT Track | ELT Correlate | ELT Weapons Assg | ELT Command | SAR Voice Comm | SAR Display | SAR Identify | SAR Track | SAR Correlate | SAR Command | OTW Voice Comm | OTW Identify | OTW Display | OTW Command |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SPS-49 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SPS-67 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SUTEC DOUBLE EAGLE | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLQ-32 | | | | | | | | | | X | X | X | | X | | | | X | X | | X | | | | | |
| VIDEO/OPTICAL | | X | X | X | | | | | | X | X | X | X | X | | | | | X | X | X | | | | | |
| ACDS | | X | X | X | X | X | | | | X | X | X | X | X | X | X | | X | X | X | X | X | | X | X | X |
| CEC | | | | | | | | | | | | | | | | | | | | | | | | | | |
| JMCIS | | X | X | X | X | X | | | | X | X | X | X | X | X | X | | X | X | X | X | X | | X | X | X |
| DOLPHIN | | | | | | | | | | | X | X | X | X | | | | | X | X | X | | | X | | |
| SMALL BOATS (3) | | | | | | | | | | | X | X | X | X | | | | | X | X | X | | | X | | |
| IFF | | | | | | | | | | | X | X | | X | | | | | X | | X | | | X | | |
| GFCS | | | | | | | | | | X | | | X | X | X | | | X | | X | X | | | | X | |
| GFCS RADAR | | | | | | | | | | | | | X | X | | | | | | X | X | | | | | |
| IR Mk-46 | | | | | | | | | | X | X | X | | X | | | | X | X | | X | | | X | | |
| VOICE COMMS | X | | | | | | | | X | | | | | | X | X | X | | | | | X | X | X | X | X |
| GPS | | | | | | | | | | | | | | | | X | | | | | | X | | | | |
| TACAN | | | | | | | | | | | | | | | | X | | | | | | X | | | | |
| RING INFO. NETWORK | | X | X | X | X | X | | | | X | X | X | X | X | X | X | | X | X | X | X | X | | X | X | X |
| WCS | | | | | | | | | | | | | | | X | X | | | | | | | | | | |
| ISDS | | | | | | | | | | | | | | | X | X | | | | | | | | | | |
| 40 MM GUN (1) | | | | | | | | | | | | | | | | | | | | | | | | | | |
| STINGER | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BUOY EQUIP | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Requirements | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A1 | | | | | | | | | X | X | | | | | | | X | X | | | | | X | | X | |
| A2 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A3 | | | | | | | | | X | | | | | | | | | | | | | | X | | | |
| A4 | | | | | | | | | X | X | X | X | X | X | X | X | | | | | | | | | | |
| A5 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A6 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A7 | | | | | | | | | | | | | | | | | X | X | X | X | X | X | X | X | X | X |
| A8 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A9 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A11 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A13 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C1 | | | | | | | | | | X | X | X | X | X | X | X | | X | X | X | X | X | | | | |
| C2 | | | | | | | | | | X | X | X | X | X | X | X | | X | X | X | X | X | | | | |
| C3 | | | | | | | | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | |
| C4 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C5 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C6 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C7 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C8 | | | | | | | | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | |

Table F-17: Functional Allocation - Control (Coast Guard option 3)

| Elements | AAW | | | | | ASW | | | ASUW | | | | | MIW | | STW | | AMW | | | | ELT | | | | | | | SAR | | | OTW | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coast Guard Option 3 | Illumination | Weapon Delivery | Guidance | Soft Kill | Kill Eval. | Weapon Delivery | Soft Kill | Kill Eval. | Illumination | Weapon Delivery | Guidance | Soft Kill | Kill Eval. | Mark | Clear | Weapon Delivery | Kill Eval. | Illumination | Weapon Delivery | Guidance | Kill Eval. | Intercept | Board | Illumination | Weapon Delivery | Guidance | Soft Kill | Kill Eval. | Platform Delivery | Evaluation | Facilities (Med. et | Platform Delivery | Evaluation | Facilities (Med. et |
| SPS-49 | | | | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | |
| SPS-67 | | | | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | |
| SUTEC DOUBLE EAGLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLQ-32 | | | | X | X | | | | | | | X | X | | | | | | | | | | | | | | X | X | | | | | | |
| VIDEO/OPTICAL | | | | | X | | | | | | | | X | | | | | | | | X | | | | | | | X | | X | | | X | |
| ACDS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CEC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| JMCIS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DOLPHIN | | | | | | X | | X | | | | | X | | | | | | | | X | X | X | | | | | X | X | X | | X | X | |
| SMALL BOATS (3) | | | | | | | | | | | | | X | | | X | | | | | | X | X | | X | | | X | X | X | | X | X | |
| IFF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GFCS | | | | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | |
| GFCS RADAR | X | | | | | | | | X | | | | | | | | | X | | | | | | X | | | | | | | | | | |
| IR Mk-46 | | | | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | |
| VOICE COMMS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GPS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TACAN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RING INFO. NETWORK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WCS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 40 MM GUN (1) | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | | | | |
| STINGER | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SRBOC | | | | X | | | | | | | | X | | | | | | | | | | | | | | | X | | | | | | | |
| NIXIE | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BUOY EQUIP | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | X | | |
| EOD TEAM | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | X | | | X |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Requirements | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A4 | | | | | | | | | X | X | | X | | | | | | | | | | X | X | X | X | X | X | X | | | | | | |
| A5 | | | | | | X | | X | | | | | X | | | | | | | | X | X | X | | X | | | X | X | X | | X | X | |
| A6 | | | | | | | | | | | | | X | | | X | | | | | | X | X | | X | | | X | X | X | | X | X | |
| A7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | X | X | X | X |
| A8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A9 | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | |
| A10 | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | X | | | X |
| A11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X |
| A13 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C1 | X | X | | X | X | X | X | X | X | X | | X | X | | | | | | | | | X | X | X | X | X | X | X | | | | | | |
| C2 | X | X | | X | X | X | X | X | X | X | | X | X | | | | | | | | | | | X | X | X | X | X | | | | | | |
| C3 | X | X | | X | X | X | X | X | X | X | | X | X | | | | | | | | | | | X | X | X | X | X | | | | | | |
| C4 | | | | | | | | | | | | | | X | X | | | | | | | | | | | | | | | | | | | |
| C5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | | |
| C6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | |
| C7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X |
| C8 | X | X | | X | X | X | X | X | X | X | | X | X | X | X | | | | | | | | X | X | X | X | X | X | X | X | X | X | X | X |

Table F-18: Functional Allocation - Engagement (Coast Guard option 3)

# APPENDIX G

## ELEMENT INTERFACE TABLES

## SUMMARY

Element Interface tables were used to depict how each element in the system will be connected to other elements in the system and provided a basis on which to develop the Comabt System architecture. An element interface matrix was constructed for each whole ship option and are located in the tables listed below:

G-1: Element Interface Matrix (Navy option 1)
G-2: Element Interface Matrix (Navy option 2)
G-3: Element Interface Matrix (Navy option 3)
G-4: Element Interface Matrix (Coast Guard option 1)
G-5: Element Interface Matrix (Coast Guard option 2)
G-6: Element Interface Matrix (Coast Guard option 3)

| Navy Option 1 | SPY-1D | SPS-67 | TAS | SQS-56 | SQR-19 | SH-100 | SLQ-32 | VIDEO/OPTICAL | ACDS | CEC | JMICS | PANTHER | SMALL BOATS (4) | IFF | MK 99 | - SPG-62 | Mk 34 GFCS | - SPG-60/SPQ-9 | IR MK-46 | SQQ-89 | - Mk-309 ASWFC | VOICE COMMS | GPS | TACAN | RING INFO. NET. | WCS | ISDS | 155 mm GUN | CIWS | Mk 49 (RAM LNCHR) | - RAM | VLS | - HARPOON | - TOMAHAWK | - ESS | - SM-2 MR | - VLA | SVTT | - MK 50 | SRBOC | NIXIE | EOD TEAM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SPY-1D | X | | | | | | L | | | D | | | | E | D | | D | | | | | | | | D | | | | | | | | | | | | | | | | | |
| SPS-67 | | X | | | | | L | | | D | | | | E | D | | D | | | | | | | | D | | | | | | | | | | | | | | | | | |
| TAS | | | X | | | | L | | | D | | | | | D | | D | | | | | | | | D | | | | | D | | | | | | | | | | | | |
| SQR-19 | | | | X | | | | | | | | | | | | | | | | D | D | | | | D | | | | | | | | | | | | | | | | | |
| SQS-56 | | | | | X | | | | | | | | | | | | | | | D | D | | | | D | | | | | | | | | | | | | | | | | |
| SH-100 | | | | | | X | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | | | | | | L |
| SLQ-32 | L | L | L | | | | X | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | | | | L | | |
| VIDEO/OPTICAL | | | | | | | | X | | | | | | | D | | D | | D | | | | | | D | | | | | | | | | | | | | | | | | |
| ACDS | | | | | | | | | X | | | | | | | | | | | | | | | | D | | | | | | | | | | | | | | | | | |
| CEC | D | D | D | | | | | | | X | | | | | | | | | | | | | | | D | | | | | | | | | | | | | | | | | |
| JMICS | | | | | | | | | | | X | | | | | | | | | | | | | | D | | | | | | | | | | | | | | | | | |
| PANTHER | | | | | | | | | | | | X | | | | | | | | D | | E | | D | D | | | | | | | | | | | | | | EM | | | |
| SMALL BOATS (4) | | | | | | | | | | | | | X | | | | | | | | | E | | | | | | | | | | | | | | | | | | | | M |
| IFF | E | E | | | | | | | | | | | | X | | | | | | | | | | | D | | | | | | | | | | | | | | | | | |
| MK 99 | D | D | D | | | | | D | | | | | | | X | D | | | D | | | | | | D | D | D | | | D | | D | | | | | | | | | | |
| - SPG-62 | | | | | | | | | | | | | | | D | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mk 34 GFCS | D | D | D | | | | | D | | | | | | | | | X | D | D | | | | | | D | D | D | D | | | | | | | | | | | | | | |
| - SPG-60/SPQ-9 | | | | | | | | | | | | | | | | | D | X | | | | | | | | | | | | | | | | | | | | | | | | |
| IR Mk-46 | | | | | | | | D | | | | | | | D | | D | | X | | | | | | D | | | | | | | | | | | | | | | | | |
| SQQ-89 | | | | D | D | | | | | | | D | | | | | | | | X | D | | | | D | D | | | | | | | | | | | | | | | ML | |
| - Mk-309 ASWFC | | | | D | D | | | | | | | | | | | | | | | D | X | | | | D | D | | | | | | D | | | | | | D | E | | | |
| VOICE COMMS | | | | | | | | | | | | E | E | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | E |
| GPS | | | | | | | | | | | | | | | | | | | | | | | X | | D | | | | | | | | | | | | | | | | | D |
| TACAN | | | | | | | | | | | | D | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | |
| RING INFO. NETWORK | D | D | D | D | D | D | D | D | D | D | D | | | D | D | | D | D | D | D | D | | D | | X | D | D | | D | | | | | | | | | | | D | | |
| WCS | | | | | | | | | | | | | | | D | | D | | | D | D | | | | D | X | D | | | L | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | | | | D | | D | | | | | | | | D | D | X | | D | D | | D | | | | | | | | D | | |
| 155 mm GUN | | | | | | | | | | | | | | | | | D | | | | | | | | | | | X | | | | | | | | | | | | | | |
| CIWS (2) | | | | | | | | | | | | | | | | | | | | | | | | | D | | D | | X | | | | | | | | | | | | | |
| Mk 49 (RAM LNCHR) | | | D | | | | | | | | | | | | D | | | | | | | | | | | L | D | | | X | EM | | | | | | | | | | | |
| - RAM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | EM | X | | | | | | | | | | | |
| VLS | | | | | | | | | | | | | | | D | | | | | | D | | | | | | D | | | | | X | EM | EM | EM | EM | EM | | | | | |
| - HARPOON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | EM | X | | | | | | | | | |
| - TOMAHAWK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | EM | | X | | | | | | | | |
| - ESS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | EM | | | X | | | | | | | |
| - SM-2 MR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | EM | | | | X | | | | | | |
| - VLA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | EM | | | | | X | | | | | |
| SVTT | | | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | | | | | | X | EM | | | |
| - MK 50 | | | | | | | | | | | | EM | | | | | | | | | E | | | | | | | | | | | | | | | | | EM | X | | | |
| SRBOC | | | | | | | L | | | | | | | | | | | | | | | | | | D | | D | | | | | | | | | | | | | X | | |
| NIXIE | | | | | | | | | | | | | | | | | | | | ML | | | | | | | | | | | | | | | | | | | | | X | |
| EOD TEAM | | | | | | L | | | | | | | M | | | | | | | | | E | D | | | | | | | | | | | | | | | | | | | X |

LEGEND: E=Electronic, M=Mechanical, D=Data, L=Logic

Table G-1: Element Interface Matrix (Navy option 1)

| Navy Option 2 | XPAR | SPS-67 | ATAS | SH-100 | SLQ-32 | VIDEO/OPTICAL | ACDS | CEC | JMICS | PANTHER | SMALL BOATS (2) | IFF | MK 99 | - SPG-62 | Mk 34 GFCS | - SPG-60/SPQ-9 | IR MK-46 | SQQ-89 | - MK-116 ASWFC | VOICE COMMS | GPS | TACAN | RING INFO. NET. | WCS | ISDS | 127 mm GUN | 40 mm GUNS (2) | VLS | - HARPOON | - TOMAHAWK | - ESS | - SM-2 MR | - VLA | SVTT | - MK 50 | SRBOC | NIXIE | EOD TEAM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| XPAR | X | | | | L | | | D | | | | E | D | | D | | | | | | | | D | | | | | | | | | | | | | | | |
| SPS-67 | | X | | | L | | | D | | | | E | D | | D | | | | | | | | D | | | | | | | | | | | | | | | |
| ATAS | | | X | | | | | | | | | | | | | | | D | D | | | | D | | | | | | | | | | | | | | | |
| SH-100 | | | | X | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | | | | L |
| SLQ-32 | L | L | | | X | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | | L | | |
| VIDEO/OPTICAL | | | | | | X | | | | | | | D | | D | | D | | | | | | D | | | | | | | | | | | | | | | |
| ACDS | | | | | | | X | | | | | | | | | | | | | | | | D | | | | | | | | | | | | | | | |
| CEC | D | D | | | | | | X | | | | | | | | | | | | | | | D | | | | | | | | | | | | | | | |
| JMICS | | | | | | | | | X | | | | | | | | | | | | | | D | | | | | | | | | | | | | | | |
| PANTHER | | | | | | | | | | X | | | | | | | | D | | E | | D | D | | | | | | | | | | | | EM | | | |
| SMALL BOATS (2) | | | | | | | | | | | X | | | | | | | | | E | | | | | | | | | | | | | | | | | | M |
| IFF | E | E | | | | | | | | | | X | | | | | | | | | | | D | | | | | | | | | | | | | | | |
| MK 99 | D | D | | | | D | | | | | | | X | D | | | D | | | | | | D | D | D | | | D | | | | | | | | | | |
| - SPG-62 | | | | | | | | | | | | | D | X | | | | | | | | | | | | | | | | | | | | | | | | |
| Mk 34 GFCS | D | D | | | | D | | | | | | | | | X | D | D | | | | | | D | D | D | D | | | | | | | | | | | | |
| - SPG-60/SPQ-9 | | | | | | | | | | | | | | | D | X | | | | | | | D | | | | | | | | | | | | | | | |
| IR MK-46 | | | | | | D | | | | | | | D | | D | X | X | | | | | | D | | | | | | | | | | | | | | | |
| SQQ-89 | | | D | | | | | | | D | | | | | | | | X | D | | | | D | D | | | | | | | | | | | | | ML | |
| - MK-116 ASWFC | | | D | | | | | | | | | | | | | | | D | X | | | | D | D | | | | D | | | | | | D | E | | | |
| VOICE COMMS | | | | | | | | | | E | E | | | | | | | | | X | | | | | | | | | | | | | | | | | | E |
| GPS | | | | | | | | | | | | | | | | | | | | | X | | D | | | | | | | | | | | | | | | D |
| TACAN | | | | | | | | | | D | | | | | | | | | | | | X | | | | | | | | | | | | | | | | |
| RING INFO. NETWORK | D | D | D | D | D | D | D | D | D | D | | D | D | | D | D | D | D | D | | D | | X | D | D | | D | | | | | | | | | D | | |
| WCS | | | | | | | | | | | | | D | | D | | | D | D | | | | D | X | D | | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | | D | | D | | | | | | | | D | D | X | | D | D | | | | | | | | D | | |
| 127 mm GUN | | | | | | | | | | | | | | | D | | | | | | | | | | | X | | | | | | | | | | | | |
| 40 mm GUNS (2) | | | | | | | | | | | | | | | | | | | | | | | D | | D | | X | | | | | | | | | | | |
| VLS | | | | | | | | | | | | | D | | | | | | D | | | | | | D | | | X | EM | EM | EM | EM | EM | | | | | |
| - HARPOON | | | | | | | | | | | | | | | | | | | | | | | | | | | | EM | | | | | | | | | | |
| - TOMAHAWK | | | | | | | | | | | | | | | | | | | | | | | | | | | | EM | | X | | | | | | | | |
| - ESS | | | | | | | | | | | | | | | | | | | | | | | | | | | | EM | | | X | | | | | | | |
| - SM-2 MR | | | | | | | | | | | | | | | | | | | | | | | | | | | | EM | | | | X | | | | | | |
| - VLA | | | | | | | | | | | | | | | | | | | | | | | | | | | | EM | | | | | X | | | | | |
| SVTT | | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | | | | X | EM | | | |
| - MK 50 | | | | | | | | | | EM | | | | | | | | | E | | | | | | | | | | | | | | | EM | X | | | |
| SRBOC | | | | | L | | | | | | | | | | | | | | | | | | D | | D | | | | | | | | | | | X | | |
| NIXIE | | | | | | | | | | | | | | | | | | ML | | | | | | | | | | | | | | | | | | | X | |
| EOD TEAM | | | | L | | | | | | | M | | | | | | | | | E | D | | | | | | | | | | | | | | | | | X |

LEGEND: E=Electronic, M=Mechanical, D=Data, L=Logic

**Table G-2: Element Interface Matrix (Navy option 2)**

| Navy Option 3 | SPS-49 | SPS-67 | TAS | SQR-19 | SUTEC DOUBLE EAGLE | SLQ-32 | VIDEO/OPTICAL | ACDS | CEC | JMICS | PANTHER | SMALL BOATS (2) | IFF | MK 86 GFCS | - SPG-60/SPQ-9 | IR MK-46 | SQQ-89 | VOICE COMMS | GPS | TACAN | RING INFO NETWORK | WCS | ISDS | 127 mm GUN | 40 mm GUNS (2) | CANNISTER | - HARPOON | ABL | - TOMAHAWK | MK-49 (RAM LAUNCHER) | - RAM | SVTT | - MK 50 | SRBOC | NIXIE | EOD TEAM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SPS-49 | X | | | | | L | | | D | | | | E | D | | | | | | | D | | | | | | | | | | | | | | | |
| SPS-67 | | X | | | | L | | | D | | | | E | D | | | | | | | D | | | | | | | | | | | | | | | |
| TAS | | | X | | | L | | | D | | | | | D | | | | | | | D | | | | | | | | | D | | | | | | |
| SQR-19 | | | | X | | | | | | | | | | | | | D | | | | D | | | | | | | | | | | | | | | |
| SUTEC DOUBLE EAGLE | | | | | X | | | | | | | | | | | | | | | | D | | | | | | | | | | | | | | | L |
| SLQ-32 | L | L | L | | | X | | | | | | | | | | | | | | | D | | | | | | | | | | | | | L | | |
| VIDEO/OPTICAL | | | | | | | X | | | | | | | D | | D | | | | | D | | | | | | | | | | | | | | | |
| ACDS | | | | | | | | X | | | | | | | | | | | | | D | | | | | | | | | | | | | | | |
| CEC | D | D | D | | | | | | X | | | | | | | | | | | | D | | | | | | | | | | | | | | | |
| JMICS | | | | | | | | | | X | | | | | | | | | | | D | | | | | | | | | | | | | | | |
| PANTHER | | | | | | | | | | | X | | | | | | D | E | | D | D | | | | | | | | | | | | EM | | | |
| SMALL BOATS (2) | | | | | | | | | | | | X | | | | | | E | | | | | | | | | | | | | | | | | | M |
| IFF | E | E | | | | | | | | | | | X | | | | | | | | D | | | | | | | | | | | | | | | |
| MK 86 GFCS | D | D | D | | | | D | | | | | | | X | D | D | | | | | D | D | D | D | | | | | | | | | | | | |
| - SPG-60/SPQ-9 | | | | | | | | | | | | | | D | X | | | | | | D | | | | | | | | | | | | | | | |
| IR MK-46 | | | | | | | D | | | | | | | D | | X | | | | | D | | | | | | | | | | | | | | | |
| SQQ-89 | | | | D | | | | | | | D | | | | | | X | | | | D | D | | | | | | | | | | L | | | ML | |
| VOICE COMMS | | | | | | | | | | | E | E | | | | | | X | | | | | | | | | | | | | | | | | | E |
| GPS | | | | | | | | | | | | | | | | | | | X | | D | | | | | | | | | | | | | | | D |
| TACAN | | | | | | | | | | | D | | | | | | | | | X | | | | | | | | | | | | | | | | |
| RING INFO. NETWORK | D | D | D | D | D | D | D | D | D | D | D | | D | D | D | D | D | | D | | X | D | D | | D | | | | | | | | | D | | |
| WCS | | | | | | | | | | | | | | D | | | D | | | | D | D | D | | | | | | | L | | | | | | |
| ISDS | | | | | | | | | | | | | | D | | | | | | | D | D | X | | D | | | | | D | | | | D | | |
| 127 mm GUN | | | | | | | | | | | | | | D | | | | | | | | | | X | | | | | | | | | | | | |
| 40 mm GUNS (2) | | | | | | | | | | | | | | | | | | | | | D | | D | | X | | | | | | | | | | | |
| CANNISTER | | | | | | | | | | | | | | | | | | | | | | | | | | X | EM | | | | | | | | | |
| - HARPOON | | | | | | | | | | | | | | | | | | | | | | | | | | EM | X | | | | | | | | | |
| ABL | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | EM | | | | | | | |
| - TOMAHAWK | | | | | | | | | | | | | | | | | | | | | | | | | | | | EM | X | | | | | | | |
| MK49 (RAM LAUNCHER) | | | D | | | | | | | | | | | | | | | | | | | L | D | | | | | | | X | EM | | | | | |
| - RAM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | EM | X | | | | | |
| SVTT | | | | | | | | | | | | | | | | | L | | | | | | | | | | | | | | | X | EM | | | |
| - MK 50 | | | | | | | | | | | EM | | | | | | | | | | | | | | | | | | | | | EM | X | | | |
| SRBOC | | | | | | L | | | | | | | | | | | | | | | D | | D | | | | | | | | | | | X | | |
| NIXIE | | | | | | | | | | | | | | | | | ML | | | | | | | | | | | | | | | | | | X | |
| EOD TEAM | | | | | L | | | | | | | M | | | | | | E | D | | | | | | | | | | | | | | | | | X |

LEGEND: E=Electronic, M=Mechanical, D=Data, L=Logic

**Table G-3: Element Interface Matrix (Navy option 3)**

| COAST GUARD Option 1 | SPY-1D | SPS-67 | TAS | SQS-56 | SH-100 | SLQ-32 | VIDEO/OPTICAL | ACDS | CEC | JMCIS | DOLPHIN | SMALL BOATS (4) | IFF | Mk 92 GFCS | CAS/STIR | IR MK-46 | SQQ-89 | Mk-309 ASWFC | VOICE COMMS | GPS | TACAN | RING INFO NET. | WCS | ISDS | 76 mm GUN | CIWS | Mk 49 (RAM LNCHR | RAM | SVTT | MK 50 | SRBOC | NIXIE | BUOY EQUIP | EOD TEAM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SPY-1D | X | | | | | L | | | D | | | | E | D | | | | | | | | D | | | | | | | | | | | | |
| SPS-67 | | X | | | | L | | | D | | | | E | D | | | | | | | | D | | | | | | | | | | | | |
| TAS | | | X | | | L | | | D | | | | | D | | | | | | | | D | | | | | D | | | | | | | |
| SQS-56 | | | | X | | | | | | | | | | | | | D | D | | | | D | | | | | | | | | | | | |
| SH-100 | | | | | X | | | | | | | | | | | | | | | | | D | | | | | | | | | | | | L |
| SLQ-32 | L | L | L | | | X | | | | | | | | | | | | | | | | D | | | | | | | | | L | | | |
| VIDEO/OPTICAL | | | | | | | X | | | | | | | D | | D | | | | | | D | | | | | | | | | | | | |
| ACDS | | | | | | | | X | | | | | | | | | | | | | | D | | | | | | | | | | | | |
| CEC | D | D | D | | | | | | X | | | | | | | | | | | | | D | | | | | | | | | | | | |
| JMCIS | | | | | | | | | | X | | | | | | | | | | | | D | | | | | | | | | | | | |
| DOLPHIN | | | | | | | | | | | X | | | | | | D | | E | | D | D | | | | | | | | M,E | | | | |
| SMALL BOATS (4) | | | | | | | | | | | | X | | | | | | | E | | | | | | | | | | | | | | | M |
| IFF | E | E | | | | | | | | | | | X | | | | | | | | | D | | | | | | | | | | | | |
| MK 92 GFCS | D | D | D | | | | D | | | | | | | X | D | D | | | | | | D | D | D | D | | | | | | | | | |
| CAS/STIR | | | | | | | | | | | | | | D | X | | | | | | | D | | | | | | | | | | | | |
| IR Mk-46 | | | | | | | D | | | | | | | D | | X | | | | | | D | | | | | | | | | | | | |
| SQQ-89 | | | | D | | | | | | | D | | | | | | X | D | | | | D | D | | | | | | | | | L | | |
| Mk-309 ASWFC | | | | D | | | | | | | | | | | | | D | X | | | | D | D | | | | | D | E | | | | | |
| VOICE COMMS | | | | | | | | | | | E | E | | | | | | | X | | | | | | | | | | | | | | | E |
| GPS | | | | | | | | | | | | | | | | | | | | X | | D | | | | | | | | | | | | |
| TACAN | | | | | | | | | | | D | | | | | | | | | | X | | | | | | | | | | | | | |
| RING INFO. NETWORK | D | D | D | D | D | D | D | D | D | D | D | | D | D | D | D | D | D | | D | | X | D | D | | D | | | | | | | | |
| WCS | | | | | | | | | | | | | | D | | | D | D | | | | D | X | D | | | L | | | | | | | |
| ISDS | | | | | | | | | | | | | | D | | | | | | | | D | D | X | | D | D | | | | | | | |
| 76 MM | | | | | | | | | | | | | | D | | | | | | | | | | | X | | | | | | | | | |
| CIWS (1) | | | | | | | | | | | | | | | | | | | | | | D | | D | | X | | | | | | | | |
| Mk 49 (RAM LNCHR) | | | D | | | | | | | | | | | | | | | | | | | | L | D | | | X | M,E | | | | | | |
| RAM | | | | | | | | | | | | | | | | | | | | | | | | | | | M,E | X | | | | | | |
| SVTT | | | | | | | | | | | | | | | | | | D | | | | | | | | | | | X | M,E | | | | |
| MK 50 | | | | | | | | | | | | | | | | | | E | | | | | | | | | | | M,E | X | | | | |
| SRBOC | | | | | | L | | | | | | | | | | | | | | | | | | | | | | | | | X | | | |
| NIXIE | | | | | | | | | | | | | | | | | L | | | | | | | | | | | | | | | X | | |
| BUOY EQUIP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | |
| EOD TEAM | | | | | L | | | | | | | M | | | | | | | E | | | | | | | | | | | | | | | X |

E=ELECTRONIC M=MECHANICAL
L=LOGIC D=DATA

**Table G-4: Element Interface Matrix (Coast Guard option1)**

| COAST GUARD Option 2 | XPAR | SPS-67 | TAS | SH-100 | SLQ-32 | VIDEO/OPTICAL | ACDS | CEC | JMCIS | DOLPHIN | SMALL BOATS (4) | IFF | GFCS | GFCS RADAR | IR MK-46 | VOICE COMMS | GPS | TACAN | RING INFO NET. | WCS | ISDS | 40 mm GUNS | Mk 49 (RAM LNCHR | RAM | SRBOC | NIXIE | BUOY EQUIP | EOD TEAM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| XPAR | X | | | | L | | | D | | | | E | D | | | | | | D | | | | | | | | | |
| SPS-67 | | X | | | L | | | D | | | | E | D | | | | | | D | | | | | | | | | |
| TAS | | | X | | L | | | D | | | | | D | | | | | | D | | | | D | | | | | |
| SH-100 | | | | X | | | | | | | | | | | | | | | D | | | | | | | | | |
| SLQ-32 | L | L | L | | X | | | | | | | | | | | | | | D | | | | | | L | | | L |
| VIDEO/OPTICAL | | | | | | X | | | | | | | D | | D | | | | D | | | | | | | | | |
| ACDS | | | | | | | X | | | | | | | | | | | | D | | | | | | | | | |
| CEC | D | D | D | | | | | X | | | | | | | | | | | D | | | | | | | | | |
| JMCIS | | | | | | | | | X | | | | | | | | | | D | | | | | | | | | |
| DOLPHIN | | | | | | | | | | X | | | | | | E | | D | D | | | | | | | | | |
| SMALL BOATS (4) | | | | | | | | | | | X | | | | | E | | | | | | | | | | | | |
| IFF | E | E | | | | | | | | | | X | | | | | | | D | | | | | | | | | M |
| GFCS | D | D | D | | | D | | | | | | | X | D | D | | | | D | D | D | | | | | | | |
| GFCS RADAR | | | | | | | | | | | | | D | X | | | | | D | | | | | | | | | |
| IR Mk-46 | | | | | | D | | | | | | | D | | X | | | | D | | | | | | | | | |
| VOICE COMMS | | | | | | | | | | E | E | | | | | X | | | | | | | | | | | | |
| GPS | | | | | | | | | | | | | | | | | X | | D | | | | | | | | | E |
| TACAN | | | | | | | | | | D | | | | | | | | X | | | | | | | | | | |
| RING INFO NETWORK | D | D | D | D | D | D | D | D | D | D | | D | D | D | D | | D | | X | D | D | D | | | | | | |
| WCS | | | | | | | | | | | | | D | | | | | | D | X | D | | L | | | | | |
| ISDS | | | | | | | | | | | | | D | | | | | | D | D | X | D | D | | | | | |
| 40 MM GUNS (2) | | | | | | | | | | | | | | | | | | | D | | D | X | | | | | | |
| Mk 49 (RAM LNCHR) | | | D | | | | | | | | | | | | | | | | | L | D | | X | M,E | | | | |
| RAM | | | | | | | | | | | | | | | | | | | | | | | M,E | X | | | | |
| SRBOC | | | | | L | | | | | | | | | | | | | | | | | | | | X | | | |
| NIXIE | | | | | | | | | | | | | | | | | | | | | | | | | | X | | |
| BUOY EQUIP | | | | | | | | | | | | | | | | | | | | | | | | | | | X | |
| EOD TEAM | | | | L | | | | | | | M | | | | | E | | | | | | | | | | | | X |

E=ELECTRONIC M=MECHANICAL
L=LOGIC D=DATA

**Table G-5: Element Interface Matrix (Coast Guard option 2)**

| COAST GUARD Option 3 | SPS-49 | SPS-67 | SUTEC DOUBLE EA | SLQ-32 | VIDEO/OPTICAL | ACDS | CEC | JMCIS | DOLPHIN | SMALL BOATS (3) | IFF | GFCS | GFCS RADAR | IR MK-46 | VOICE COMMS | GPS | TACAN | RING INFO NET. | WCS | ISDS | 40 mm GUN (1) | STINGER | SRBOC | NIXIE | BUOY EQUIP | EOD TEAM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SPS-49 | X | | | L | | | D | | | | E | D | | | | | | D | | | | | | | | |
| SPS-67 | | X | | L | | | D | | | | E | D | | | | | | D | | | | | | | | |
| SUTEC DOUBLE EAGLE | | | X | | | | | | | | | | | | | | | D | | | | | | | | |
| SLQ-32 | L | L | | X | | | | | | | | | | | | | | D | | | | | L | | | L |
| VIDEO/OPTICAL | | | | | X | | | | | | | D | | D | | | | D | | | | | | | | |
| ACDS | | | | | | X | | | | | | | | | | | | D | | | | | | | | |
| CEC | D | D | | | | | X | | | | | | | | | | | D | | | | | | | | |
| JMCIS | | | | | | | | X | | | | | | | | | | D | | | | | | | | |
| DOLPHIN | | | | | | | | | X | | | | | | E | | D | D | | | | | | | | |
| SMALL BOATS (3) | | | | | | | | | | X | | | | | E | | | | | | | | | | | |
| IFF | E | E | | | | | | | | | X | | | | | | | D | | | | | | | | M |
| GFCS | D | D | | | D | | | | | | | X | D | D | | | | D | D | D | | | | | | |
| GFCS RADAR | | | | | | | | | | | | D | X | | | | | D | | | | | | | | |
| IR Mk-46 | | | | | D | | | | | | | D | | X | | | | D | | | | | | | | |
| VOICE COMMS | | | | | | | | | E | E | | | | | X | | | | | | | L | | | | |
| GPS | | | | | | | | | | | | | | | | X | | D | | | | | | | | E |
| TACAN | | | | | | | | | D | | | | | | | | X | | | | | | | | | |
| RING INFO NETWORK | D | D | D | D | D | D | D | D | D | | D | D | D | D | | D | | X | D | D | D | | | | | |
| WCS | | | | | | | | | | | | D | | | | | | D | X | D | | | | | | |
| ISDS | | | | | | | | | | | | D | | | | | | D | D | X | D | | | | | |
| 40 MM GUN (1) | | | | | | | | | | | | | | | | | | D | | D | X | | | | | |
| STINGER | | | | | | | | | | L | | | | | | | | | | | | X | | | | |
| SRBOC | | | | L | | | | | | | | | | | | | | | | | | | X | | | |
| NIXIE | | | | | | | | | | | | | | | | | | | | | | | | X | | |
| BUOY EQUIP | | | | | | | | | | | | | | | | | | | | | | | | | X | |
| EOD TEAM | | | L | | | | | | | M | | | | | E | | | | | | | | | | | X |

E=ELECTRONIC M=MECHANICAL
L=LOGIC D=DATA

**Table G-6: Element Interface Matrix (Coast Guard option 3)**

# APPENDIX H

## ELEMENT VS. SHIP SUPPORT MATRICES

# SUMMARY

A ship support matrix was constructed for each whole ship option to provide a basis for the type and amount of support needed from the ship to operate each Combat System suite. The Navy option 1 and Coast Guard option 1 suites are shown in this appendix due to their extensive list of high-end systems. The remaining suites can be characterized as a subset of the suites shown below:

H-1: Ship Support Matrix (Navy option 1)

H-2: Ship Support Matrix (Coast Guard option 1)

| Elements | Electric power | 400 Hz Electric | Chilled Water | A/C Ventilation | High Strength Structure | Fire Protection System | Ammunition loading equipm | Hydraulic Systems | HP air | LP air | Nitrogen | Salt Water Cooling | Gyro Inputs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SPY-1D | X | X | X | X | | | | | | X | | | X |
| SPS-67 | X | X | X | X | X | | | | | X | | X | X |
| TAS | X | X | X | X | X | | | | | X | | X | X |
| SQR-19 | X | X | | X | | | | | | | | | |
| SQS-56 | X | X | X | X | X | | | | | X | | X | X |
| SH-100 | X | | X | X | | | | | | | | | X |
| SLQ-32 | X | X | | X | | | | | | X | | | X |
| VIDEO/OPTICAL | X | X | | X | | | | | | | | | X |
| ACDS | X | | | X | | | | | | | | | |
| CEC | X | | | X | | | | | | | | | |
| JMCIS | X | | | X | | | | | | | | | |
| PANTHER | X | X | | | X | X | X | X | X | X | | | |
| SMALL BOATS (4) | X | | | | | | | X | | | | X | |
| IFF | X | X | | X | | | | | | | | | |
| MK 99 | X | X | X | X | | | | | | | | | X |
| -SPG-62 | X | X | X | X | X | | | | | X | | X | X |
| Mk 34 GFCS | X | X | X | X | | | | | | | | | X |
| SPG-60/SPQ-9 | X | X | X | X | X | | | | | X | | X | X |
| IR Mk-46 | | X | | X | | | | | | | | | X |
| SQQ-89 | X | X | | X | | | | | | | | | X |
| Mk-309 ASWFC | X | X | | X | | | | | | | | | X |
| VOICE COMMS | X | | | X | | | | | | | | | |
| GPS | X | | | | | | | | | | | | |
| TACAN | X | | | X | | | | | | | | | X |
| RING INFO NET. | X | | | X | | | | | | | | | |
| WCS | X | | | X | | | | | | | | | X |
| ISDS | X | | | X | | | | | | | | | |
| 155 mm GUN | X | X | X | | XXX | X | X | X | X | X | | X | X |
| CIWS (2) | X | X | X | | X | X | | | | | | | X |
| Mk 49 (RAM LNCHR) | X | X | | | | | | | | | | | X |
| RAM | | | | | | | | | | | | | X |
| VLS | X | | | | X | | X | X | X | X | | | X |
| HARPOON | | | | | | | | | | | | | X |
| TOMAHAWK | | | | | | | | | | | | | X |
| ESS | | | | | | | | | | | | | X |
| SM-2 MR | | | | | | | | | | | | | X |
| VLA | | | | | | | | | | | | | X |
| SVTT | X | | | | | | X | | X | | | | X |
| MK 50 | | | | | | X | X | | X | X | | | X |
| SRBOC | X | | | | | X | | | | | | | |
| NIXIE | X | | | | | | | | | | | | |
| EOD TEAM | X | | | | | | | | BYOA | | | | |

**Table H-1: Ship Support Matrix (Navy option 1)**

| Elements | Electric power | 400 Hz Electric | Chilled Water | A/C Ventilation | High Strength Structure | Fire Protection System | Ammunition loading equipm | Hydraulic Systems | HP air | LP air | Nitrogen | Salt Water Cooling | Gyro Inputs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SPY-1D | X | X | X | X | | | | | | X | | | X |
| SPS-67 | X | X | X | X | X | | | | | X | | X | X |
| TAS | X | X | X | X | X | | | | | X | | X | X |
| SQS-56 | X | X | X | X | X | | | | | X | | X | X |
| SH-100 | X | | X | X | | | | | | | | | X |
| SLQ-32 | X | X | | X | | | | | | X | | | X |
| VIDEO/OPTICAL | X | X | | X | | | | | | | | | X |
| ACDS | X | | | X | | | | | | | | | |
| CEC | X | | | X | | | | | | | | | |
| JMCIS | X | | | X | | | | | | | | | |
| DOLPHIN | X | X | | | X | X | X | X | X | X | | | |
| SMALL BOATS (4) | X | | | | | | | X | | | | X | |
| IFF | X | X | | X | | | | | | | | | |
| MK 92 GFCS | X | X | X | X | | | | | | X | | | X |
| CAS/STIR | X | X | X | X | X | | | | | X | X | X | X |
| IR Mk-46 | X | X | | X | | | | | | | | | X |
| SQQ-89 | X | X | | X | | | | | | | | | X |
| Mk-309 ASWFC | X | X | | X | | | | | | | | | X |
| VOICE COMMS | X | | | X | | | | | | | | | |
| GPS | X | | | | | | | | | | | | |
| TACAN | X | | | X | | | | | | | | | X |
| RING INFO NET. | X | | | X | | | | | | | | | |
| WCS | X | | | X | | | | | | | | | X |
| ISDS | X | | | X | | | | | | | | | |
| 76 MM | X | X | X | | X | X | X | X | X | X | | X | X |
| CIWS (1) | X | X | X | | X | X | | | | | | | X |
| Mk 49 (RAM LNCHR) | X | X | | | | | | | | | | | X |
| RAM | | | | | | | | | | | | | X |
| SVTT | X | | | | | | X | | X | | | | X |
| MK 50 | | | | | | X | X | | X | X | | | X |
| SRBOC | X | | | | | X | | | | | | | |
| NIXIE | X | | | | | | | | | | | | |
| BUOY HANDLING | X | | | | X | | | X | | X | | | |
| EOD TEAM | X | | | | | | | | BYOA | | | | |

**Table H-2: Ship Support Matrix (Coast Guard option 1)**

# APPENDIX I

## ELECTROMAGNETIC INTERFERENCE MATRIX

## SUMMARY

A table containing the operating frequencies for each element of the Combat System suite was constructed to examine areas of possible electromagnetic interference. The following tables contain the EMI matrices for each whole ship option:

Table I-1: EMI Matrix (Navy option 1)
Table I-2: EMI Matrix (Navy option 2)
Table I-2: EMI Matrix (Navy option 3)
Table I-4: EMI Matrix (Coast Guard option 1)
Table I-5: EMI Matrix (Coast Guard option 2)
Table I-6: EMI Matrix (Coast Guard option 3)

| | I | G | P | L | S | C | X | Ku | Ka | Q | V | W |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Elements | 100-150 MHz | 150-225 MHz | 225-390 MHz | 390-1550 MHz | 1.55-3.9 GHz | 3.9-6.2 GHz | 6.2-10.9 GHz | 5.25-17.25 GH | 33-36 GHz | 36-46 GHz | 46-56 GHz | 56-100 GHz |
| SPY-1D | | | | | X | | | | | | | |
| SPS-67 | | | | | | | X | | | | | |
| TAS | | | | X | | | | | | | | |
| SQR-19 | | | | | | | | | | | | |
| SQS-56 | | | | | | | | | | | | |
| SH-100 | | | | | | | | | | | | |
| SLQ-32 | | | P | P | P | P/A | P/A | P/A | | | | |
| VIDEO/OPTICAL | | | | | | | | | | | | |
| ACDS | VHF | VHF | VHF/UHF | UHF | UHF/SHF | SHF | SHF | SHF | | | | |
| CEC | VHF | VHF | VHF/UHF | UHF | UHF/SHF | SHF | SHF | SHF | | | | |
| JMCIS | VHF | VHF | VHF/UHF | UHF | UHF/SHF | SHF | SHF | SHF | | | | |
| PANTHER | | | | | | | | | | | | |
| SMALL BOATS (4) | | | | | | | | | | | | |
| IFF | | | | X | | | | | | | | |
| MK 99 | | | | | | | | | | | | |
| SPG-62 | | | | | | | X | | | | | |
| Mk 34 GFCS | | | | | | | | | | | | |
| SPG-60/SPQ-9 | | | | | | | X | | | | | |
| IR Mk-46 | | | | | | | | | | | | |
| SQQ-89 | | | | | | | | | | | | |
| Mk-309 ASWFC | | | | | | | | | | | | |
| VOICE COMMS | VHF | VHF | VHF/UHF | UHF | UHF/SHF | SHF | SHF | SHF | | | | |
| GPS | | | | | | | | | | | | |
| TACAN | | | | X | | | | | | | | |
| RING INFO NET. | | | | | | | | | | | | |
| WCS | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | |
| 155 mm GUN | | | | | | | | | | | | |
| CIWS (2) | | | | | | | | X | | | | |
| Mk 49 (RAM LNCHR) | | | | | | | | | | | | |
| RAM | | | | | | X | X | X | | | | |
| VLS | | | | | | | | | | | | |
| HARPOON | | | | | | | | | | | | |
| TOMAHAWK | | | | | | | | | | | | |
| ESS | | | | | | | | | | | | |
| SM-2 MR | | | | | | | | | | | | |
| VLA | | | | | | | | | | | | |
| SVTT | | | | | | | | | | | | |
| MK 50 | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | |

Legend
X - Indicates the band of the element
P - Indicates Passive operation for the SLQ-32
A - Indicates Active Jamming capabilities of the SLQ-32

Only radio frequencies are shown, no sonar or light frequencies.

**Table I-1: EMI Matrix (Navy option 1)**

| Elements | I<br>100-150 MHz | G<br>150-225 MHz | P<br>225-390 MHz | L<br>390-1550 MHz | S<br>1.55-3.9 GHz | C<br>3.9-6.2 GHz | X<br>6.2-10.9 GHz | Ku<br>5.25-17.25 GH | Ka<br>33-36 GHz | Q<br>36-46 GHz | V<br>46-56 GHz | W<br>56-100 GHz | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| XPAR | | | | | X | | | | | | | | |
| SPS-67 | | | | | | | X | | | | | | |
| ATAS | | | | | | | | | | | | | |
| SH-100 | | | | | | | | | | | | | |
| SLQ-32 | | | P | P | P | P/A | P/A | P/A | | | | | |
| VIDEO/OPTICAL | | | | | | | | | | | | | |
| ACDS | VHF | VHF | VHF/UHF | UHF | UHF/SHF | SHF | SHF | SHF | | | | | |
| CEC | VHF | VHF | VHF/UHF | UHF | UHF/SHF | SHF | SHF | SHF | | | | | |
| JMCIS | VHF | VHF | VHF/UHF | UHF | UHF/SHF | SHF | SHF | SHF | | | | | |
| PANTHER | | | | | | | | | | | | | |
| SMALL BOATS (2) | | | | | | | | | | | | | |
| IFF | | | | X | | | | | | | | | |
| MK 99 | | | | | | | | | | | | | |
| SPG-62 | | | | | | | X | | | | | | |
| Mk 34 GFCS | | | | | | | | | | | | | |
| SPG-60/SPQ-9 | | | | | | | X | | | | | | |
| IR MK-46 | | | | | | | | | | | | | |
| SQQ-89 | | | | | | | | | | | | | |
| MK-116 ASWFC | | | | | | | | | | | | | |
| VOICE COMMS | VHF | VHF | VHF/UHF | UHF | UHF/SHF | SHF | SHF | SHF | | | | | |
| GPS | | | | | | | | | | | | | |
| TACAN | | | | X | | | | | | | | | |
| RING INFO NET. | | | | | | | | | | | | | |
| WCS | | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | | |
| 127 mm GUN | | | | | | | | | | | | | |
| 40 mm GUNS (2) | | | | | | | | X | | | | | |
| VLS | | | | | | | | | | | | | |
| HARPOON | | | | | | | | | | | | | |
| TOMAHAWK | | | | | | | | | | | | | |
| ESS | | | | | | | | | | | | | |
| SM-2 MR | | | | | | | | | | | | | |
| VLA | | | | | | | | | | | | | |
| SVTT | | | | | | | | | | | | | |
| MK 50 | | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | | |

Legend
X - Indicates the band of the element
P - Indicates Passive operation for the SLQ-32
A - Indicates Active Jamming capabilities of the SLQ-32

Only radio frequencies are shown, no sonar or light frequencies.

**Table I-2: EMI Matrix (Navy option 2)**

| | I | G | P | L | S | C | X | Ku | Ka | Q | V | W |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Elements | 100-150 MHz | 150-225 MHz | 225-390 MHz | 390-1550 MHz | 1.55-3.9 GHz | 3.9-6.2 GHz | 6.2-10.9 GHz | 5.25-17.25 GH | 33-36 GHz | 36-46 GHz | 46-56 GHz | 56-100 GHz |
| SPS-49 | | | | X | X | | | | | | | |
| SPS-67 | | | | | | | X | | | | | |
| SQR-19 | | | | | | | | | | | | |
| SUTEC DOUBLE EAGLE | | | | | | | | | | | | |
| SLQ-32 | | | P | P | P | P/A | P/A | P/A | | | | |
| VIDEO/OPTICAL | | | | | | | | | | | | |
| ACDS | VHF | VHF | VHF/UHF | UHF | UHF/SHF | SHF | SHF | SHF | | | | |
| CEC | VHF | VHF | VHF/UHF | UHF | UHF/SHF | SHF | SHF | SHF | | | | |
| JMCIS | VHF | VHF | VHF/UHF | UHF | UHF/SHF | SHF | SHF | SHF | | | | |
| PANTHER | | | | | | | | | | | | |
| SMALL BOATS (2) | | | | | | | | | | | | |
| IFF | | | | X | | | | | | | | |
| MK 86 GFCS | | | | | | | | | | | | |
| SPG-60/SPQ-9 | | | | | | | X | | | | | |
| IR MK-46 | | | | | | | | | | | | |
| SQQ-89 | | | | | | | | | | | | |
| VOICE COMMS | VHF | VHF | VHF/UHF | UHF | UHF/SHF | SHF | SHF | SHF | | | | |
| GPS | | | | | | | | | | | | |
| TACAN | | | | X | | | | | | | | |
| RING INFO NET. | | | | | | | | | | | | |
| WCS | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | |
| 127 mm GUN | | | | | | | | | | | | |
| 40 mm GUNS (2) | | | | | | | | X | | | | |
| CANNISTER | | | | | | | | | | | | |
| HARPOON | | | | | | | | | | | | |
| ABL | | | | | | | | | | | | |
| TOMAHAWK | | | | | | | | | | | | |
| RAM | | | | | | X | X | X | | | | |
| MK49 (RAM LAUNCHER) | | | | | | | | | | | | |
| SVTT | | | | | | | | | | | | |
| MK 50 | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | |

Legend
X - Indicates the band of the element
P - Indicates Passive operation for the SLQ-32
A - Indicates Active Jamming capabilities of the SLQ-32

Only radio frequencies are shown, no sonar or light frequencies.

**Table I-3: EMI Matrix (Navy option 3)**

| | I | G | P | L | S | C | X | Ku | Ka | Q | V | W |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Elements | 100-150 MHz | 150-225 MHz | 225-390 MHz | 390-1550 MHz | 1.55-3.9 GHz | 3.9-6.2 GHz | 6.2-10.9 GHz | 5.25-17.25 GH | 33-36 GHz | 36-46 GHz | 46-56 GHz | 56-100 GHz |
| SPY-1D | | | | | X | | | | | | | |
| SPS-67 | | | | | | | X | | | | | |
| TAS | | | | | | | | | | | | |
| SQS-56 | | | | | | | | | | | | |
| SH-100 | | | | | | | | | | | | |
| SLQ-32 | | | P | P | P | P/A | P/A | P/A | | | | |
| VIDEO/OPTICAL | | | | | | | | | | | | |
| ACDS | VHF | VHF | VHF/UHF | UHF | UHF/SHF | SHF | SHF | SHF | | | | |
| CEC | VHF | VHF | VHF/UHF | UHF | UHF/SHF | SHF | SHF | SHF | | | | |
| JMCIS | VHF | VHF | VHF/UHF | UHF | UHF/SHF | SHF | SHF | SHF | | | | |
| DOLPHIN | | | | | | | | | | | | |
| SMALL BOATS (4) | | | | | | | | | | | | |
| IFF | | | | X | | | | | | | | |
| MK 92 GFCS | | | | | | | | | | | | |
| CAS/STIR | | | | | | | X | | | | | |
| IR Mk-46 | | | | | | | | | | | | |
| SQQ-89 | | | | | | | | | | | | |
| Mk-309 ASWFC | | | | | | | | | | | | |
| VOICE COMMS | VHF | VHF | VHF/UHF | UHF | UHF/SHF | SHF | SHF | SHF | | | | |
| GPS | | | | | | | | | | | | |
| TACAN | | | | X | | | | | | | | |
| RING INFO NET | | | | | | | | | | | | |
| WCS | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | |
| 76 MM | | | | | | | | | | | | |
| CIWS (1) | | | | | | | | X | | | | |
| Mk 49 (RAM LNCHR) | | | | | | | | | | | | |
| RAM | | | | | | X | X | X | | | | |
| SVTT | | | | | | | | | | | | |
| MK 50 | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | |

Legend
X - Indicates the band of the element
P - Indicates Passive operation for the SLQ-32
A - Indicates Active Jamming capabilities of the SLQ-32

Only radio frequencies are shown, no sonar or light frequencies.

**Table I-4: EMI Matrix (Coast Guard option 1)**

| Elements | I<br>100-150 MHz | G<br>150-225 MHz | P<br>225-390 MHz | L<br>390-1550 MHz | S<br>1.55-3.9 GHz | C<br>3.9-6.2 GHz | X<br>6.2-10.9 GHz | Ku<br>5.25-17.25 GH | Ka<br>33-36 GHz | Q<br>36-46 GHz | V<br>46-56 GHz | W<br>56-100 GHz |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| XPAR | | | | | X | | | | | | | |
| SPS-67 | | | | | | | X | | | | | |
| TAS | | | | X | | | | | | | | |
| SH-100 | | | | | | | | | | | | |
| SLQ-32 | | | P | P | P | P/A | P/A | P/A | | | | |
| VIDEO/OPTICAL | | | | | | | | | | | | |
| ACDS | VHF | VHF | VHF/UHF | UHF | UHF/SHF | SHF | SHF | SHF | | | | |
| CEC | VHF | VHF | VHF/UHF | UHF | UHF/SHF | SHF | SHF | SHF | | | | |
| JMCIS | VHF | VHF | VHF/UHF | UHF | UHF/SHF | SHF | SHF | SHF | | | | |
| DOLPHIN | | | | | | | | | | | | |
| SMALL BOATS (4) | | | | | | | | | | | | |
| IFF | | | | X | | | | | | | | |
| GFCS | | | | | | | | | | | | |
| GFCS RADAR | | | | | | | X | | | | | |
| IR Mk-46 | | | | | | | | | | | | |
| VOICE COMMS | VHF | VHF | VHF/UHF | UHF | UHF/SHF | SHF | SHF | SHF | | | | |
| GPS | | | | | | | | | | | | |
| TACAN | | | | X | | | | | | | | |
| RING INFO NET | | | | | | | | | | | | |
| WCS | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | |
| 40 MM GUNS (2) | | | | | | | | X | | | | |
| Mk 49 (RAM LNCHR) | | | | | | | | | | | | |
| RAM | | | | | | X | X | X | | | | |
| SRBOC | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | |

Legend
X - Indicates the band of the element
P - Indicates Passive operation for the SLQ-32
A - Indicates Active Jamming capabilities of the SLQ-32

Only radio frequencies are shown, no sonar or light frequencies.

**Table I-5: EMI Matrix (Coast Guard option 2)**

| | I | G | P | L | S | C | X | Ku | Ka | Q | V | W |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Elements | 100-150 MHz | 150-225 MHz | 225-390 MHz | 390-1550 MHz | 1.55-3.9 GHz | 3.9-6.2 GHz | 6.2-10.9 GHz | 5.25-17.25 GH | 33-36 GHz | 36-46 GHz | 46-56 GHz | 56-100 GHz |
| SPS-49 | | | | X | X | | | | | | | |
| SPS-67 | | | | | | | X | | | | | |
| SUTEC DOUBLE EAGLE | | | | | | | | | | | | |
| SLQ-32 | | | P | P | P | P/A | P/A | P/A | | | | |
| VIDEO/OPTICAL | | | | | | | | | | | | |
| ACDS | VHF | VHF | VHF/UHF | UHF | UHF/SHF | SHF | SHF | SHF | | | | |
| CEC | VHF | VHF | VHF/UHF | UHF | UHF/SHF | SHF | SHF | SHF | | | | |
| JMCIS | VHF | VHF | VHF/UHF | UHF | UHF/SHF | SHF | SHF | SHF | | | | |
| DOLPHIN | | | | | | | | | | | | |
| SMALL BOATS (3) | | | | | | | | | | | | |
| IFF | | | | X | | | | | | | | |
| GFCS | | | | | | | | | | | | |
| GFCS RADAR | | | | | | | X | | | | | |
| IR Mk-46 | | | | | | | | | | | | |
| VOICE COMMS | VHF | VHF | VHF/UHF | UHF | UHF/SHF | SHF | SHF | SHF | | | | |
| GPS | | | | | | | | | | | | |
| TACAN | | | | X | | | | | | | | |
| RING INFO NET | | | | | | | | | | | | |
| WCS | | | | | | | | | | | | |
| ISDS | | | | | | | | | | | | |
| 40 MM GUN (1) | | | | | | | | X | | | | |
| STINGER | | | | | | | | | | | | |
| SRBOC | | | | | | | | | | | | |
| NIXIE | | | | | | | | | | | | |
| EOD TEAM | | | | | | | | | | | | |

Legend
X - Indicates the band of the element
P - Indicates Passive operation for the SLQ-32
A - Indicates Active Jamming capabilities of the SLQ-32

Only radio frequencies are shown, no sonar or light frequencies.

**Table I-6: EMI Matrix (Coast Guard option 3)**

# APPENDIX J

WARSHIP 21 DATA

# SUMMARY

Warship-21 is a combatant ship design program developed by John J. McMullen Associates for NAVSEA (03D). Its intended use is directed toward feasibility studies and initial design comparisons. It is a menu-driven program that uses desired (by the user) performance and mission characteristics, empirical relationships, and known equipment characterizations to define a ship's top level characteristics (length, beam, speed, combat payload, etc.).

Enclosed in this appendix (H) are the Warship-21 reports for the various Navy version options (pp H-3 to H-12), and Coast Guard version options (H-13 to H-22). There are three options for each variant, with option 2 of each variant broken down in to three sub-options. The three sub-options were used to characterize (volume and weight) three different existing air search radars (Spy-1D, SPS-48E, and SPS-49D) as surrogates for a yet-to-be-produced, small, phased array radar (X-PAR). The option number of each report is in the upper left hand corner of each page.

The only other differences between input parameters were endurance range and speed. The Navy versions were modeled using 5,000 NM @ 20 knots. The Coast Guard versions used 8,000 NM @ 14 knots.

WARSHIP-21 SHIP DESIGN MODEL (VER 1.53) -- PAGE 1 -- 09/17/95 17:29:47

SHIP DATA FILE: CPCN2.SDF

SHIP DESCRIPTION: CPCX Option 1

NAVY OPT 1
5000 NM @ 20

DESIGN MODE: Payload Fixed

PRINCIPAL CHARACTERISTICS

| | |
|---|---|
| LBP | 421.94 FT |
| LOA | 456.97 FT |
| BEAM | 46.88 FT |
| DRAFT TO KEEL | 13.67 FT |
| DEPTH @ STA 10 | 30.00 FT |
| GMT | 5.39 FT |
| GMT/BEAM RATIO | 0.115 |
| CP | 0.588 |
| CX | 0.785 |
| CB | 0.462 |
| L/B | 9.000 |
| B/T | 3.430 |
| DISP/LENGTH RATIO | 48 |

POWER PLANT SUMMARY

| | |
|---|---|
| MAIN ENG: | GE LM-1600 ICR |
| NO. MAIN ENG: | 1 |
| SEP. CRUISE ENG: | MTU 16V1163 TB83 Diesel |
| ENG. @ CRUISE: | 2 |
| INSTALLED BHP: | 36,780 HP |
| SUST. SPEED: | 26.57 KTS |
| SUST. SHP: | 19,007 HP |
| CRUISE SPEED: | 20.00 KTS |
| CRUISE SHP: | 7,196 HP |
| RANGE: | 5,000 NM |

WEIGHT SUMMARY (LT)
* INDICATES MODIFIED SWBS

| | | |
|---|---|---|
| 100 | HULL STRUCTURE | 1,400 |
| 200 | PROPULSION | 305 |
| 300 | ELECTRICAL | 241 |
| 400 | COMM. & SURVEIL. | 145 |
| 500 | *AUX SYSTEMS | 547 |
| 600 | OUTFIT & FURN. | 261 |
| 700 | *ARMAMENT | 223 |
| SUM GROUPS 1-7 | | 3,122 |
| WEIGHT MARGIN | | 3 |
| LIGHTSHIP WEIGHT | | 3,125 |
| FUEL WEIGHT | | 294 |
| OTHER LOADS | | 150 |
| FULL LOAD DISP. | | 3,569 |
| FULL LOAD KG | | 19.99 FT |

ELECTRIC PLANT SUMMARY
* INDICATES MODIFIED LOAD

| | |
|---|---|
| GEN.MODEL: | 501-K34 |
| NO. GEN.: | 3 |
| INSTALLED kW: | 4,500 kW |
| *ELECTRIC LOAD: | 2,604 kW (w/Margins) |

COMBAT SYSTEM SUMMARY

| | |
|---|---|
| PRIMARY RADAR: | Aegis (SPY-1D) |
| SECOND. RADAR: | [None] |
| COMM./CONTROL: | Medium (FFG-7) |
| SONAR: | SQS-56 |
| HELICOPTER: | 1 SH-60B |
| GUNS: | 1 155mm |
| CIWS: | 2 Phalanx |
| TORPEDOES: | 2 Mk-32 |
| SHORT RNG AAW: | 1 21-cell RAM |
| NO. VLS CELLS: | 32 |
| STANDARD: | 13 |
| TOMAHAWK: | 11 |
| ASROC: | 8 |
| NIXIE: | Yes |
| TACTASS: | Yes |

VOLUME SUMMARY (CUFT)
* INDICATES MODIFIED SSCS

| | | |
|---|---|---|
| 1 | MISSION SUPPORT | 135,630 |
| 2 | HUMAN SUPPORT | 53,681 |
| 3 | SHIP SUPPORT | 148,830 |
| 4 | SHIP MACHINERY | 145,594 |
| TOTAL VOLUME | | 483,734 |

COST ESTIMATE SUMMARY
* INDICATES MODIFIED COST

| | |
|---|---|
| COST YEAR: | 1992 |
| NUMBER OF SHIPS: | 30 |
| LEAD SHIP COST: | $843.635 MIL |
| FOURTH SHIP COST: | $756.460 MIL |
| *PAYLOAD COST: | $156.593 MIL |
| NONRECUR. COST: | $176.335 MIL |
| AVERAGE COST: | $432.139 MIL |
| LEARNING CURVE: | 92.00 % |
| HOURS @ SEA: | 2,402 |
| HOURS IN PORT: | 1,982 |
| ANNUAL O&S COST: | $11.04 MIL |

MANNING SUMMARY
(50% MANNING REDUCTION)

| | |
|---|---|
| OFFICERS | 12 |
| CHIEFS | 10 |
| ENLISTED | 84 |
| TOTAL MANNING | 106 |
| TOTAL ACCOMMODATIONS | 119 |

WARSHIP-21 SHIP DESIGN MODEL (VER 1.53) -- PAGE 2 -- 09/17/95 17:29:49

SHIP DATA FILE: CPCN2.SDF

SHIP DESCRIPTION: CPCX Option 1

NAVY OPT 1
5000 NM @ 20

DESIGN MODE: Payload Fixed

TECHNOLOGIES INCLUDED IN MODEL:

50% Manning Reduction
Bow Bulb
Fiberoptics
Fire Zones
High Speed Hull Form
IR Insulation
Lightweight Cable
Lightweight Foundations
Machinery Monitoring & Control
Modular Combat System
Orthotropic Deckhouse
Orthotropic Decks
Producible Ship
Reverse Osmosis
Stern Wedge
URN Reduction
Waste Heat Boilers

USER-DEFINED PAYLOAD LIST:

| DESCRIPTION | SWBS | WT(LT) | KG(FT) | KW LOAD |
|---|---|---|---|---|
| rhib | 000 | 2.00 | 20.000 | 0.00 |
| rhib | 000 | 2.00 | 20.000 | 0.00 |
| Stern Ramp | 500 | 2.00 | 15.000 | 25.00 |
| SH100 Minehunting Sonar | 700 | 1.25 | 5.000 | 6.00 |
| HARPOON 4 PK | 000 | 4.00 | 40.000 | 2.00 |
| HARPOON 4 PK | 000 | 4.00 | 40.000 | 2.00 |

| DESCRIPTION | SSCS | VOL(CUFT) | COST($1983) |
|---|---|---|---|
| rhib | 0.000 | 2000.00 | 5.00E+04 |
| rhib | 0.000 | 2000.00 | 5.00E+04 |
| Stern Ramp | 0.000 | 6000.00 | 2.00E+05 |
| SH100 Minehunting Sonar | 0.000 | 200.00 | 1.00E+06 |
| HARPOON 4 PK | 0.000 | 0.00 | 3.50E+05 |
| HARPOON 4 PK | 0.000 | 0.00 | 3.50E+05 |

WARSHIP-21 SHIP DESIGN MODEL (VER 1.53) -- PAGE 1 -- 09/17/95 17:23:23

SHIP DATA FILE: CPCN2.SDF

SHIP DESCRIPTION: CPCX Option 2

NAVY OPT 2
5000 NM @ 20
SPS-49D sub for MINI SPY

DESIGN MODE: Payload Fixed

PRINCIPAL CHARACTERISTICS

| | |
|---|---|
| LBP | 400.83 FT |
| LOA | 434.10 FT |
| BEAM | 44.54 FT |
| DRAFT TO KEEL | 12.98 FT |
| DEPTH @ STA 10 | 30.00 FT |
| GMT | 5.52 FT |
| GMT/BEAM RATIO | 0.124 |
| CP | 0.588 |
| CX | 0.785 |
| CB | 0.462 |
| L/B | 9.000 |
| B/T | 3.430 |
| DISP/LENGTH RATIO | 48 |

POWER PLANT SUMMARY

| | |
|---|---|
| MAIN ENG: | GE LM-1600 ICR |
| NO. MAIN ENG: | 1 |
| SEP. CRUISE ENG: | MTU 16V1163 TB83 Diesel |
| ENG. @ CRUISE: | 2 |
| INSTALLED BHP: | 36,780 HP |
| SUST. SPEED: | 27.08 KTS |
| SUST. SHP: | 19,007 HP |
| CRUISE SPEED: | 20.00 KTS |
| CRUISE SHP: | 6,592 HP |
| RANGE: | 5,000 NM |

WEIGHT SUMMARY (LT)
* INDICATES MODIFIED SWBS

| | | |
|---|---|---|
| 100 | HULL STRUCTURE | 1,219 |
| 200 | PROPULSION | 302 |
| 300 | ELECTRICAL | 234 |
| 400 | COMM. & SURVEIL. | 60 |
| 500 | *AUX SYSTEMS | 485 |
| 600 | OUTFIT & FURN. | 227 |
| 700 | *ARMAMENT | 192 |
| | SUM GROUPS 1-7 | 2,719 |
| | WEIGHT MARGIN | 3 |
| | LIGHTSHIP WEIGHT | 2,722 |
| | FUEL WEIGHT | 204 |
| | OTHER LOADS | 134 |
| | FULL LOAD DISP. | 3,060 |
| | FULL LOAD KG | 18.59 FT |

ELECTRIC PLANT SUMMARY
* INDICATES MODIFIED LOAD

| | |
|---|---|
| GEN.MODEL: | 501-K34 |
| NO. GEN.: | 3 |
| INSTALLED kW: | 4,500 kW |
| *ELECTRIC LOAD: | 1,535 kW (w/Margins) |

COMBAT SYSTEM SUMMARY

| | |
|---|---|
| PRIMARY RADAR: | SPS-49 V(5) 2D |
| SECOND. RADAR: | [None] |
| COMM./CONTROL: | Medium (FFG-7) |
| SONAR: | [None] |
| HELICOPTER: | 1 SH-60B |
| GUNS: | 1 5-inch Mk 45 |
| CIWS: | 2 Phalanx |
| TORPEDOES: | 2 Mk-32 |
| SHORT RNG AAW: | [None] |
| NO. VLS CELLS: | 32 |
| STANDARD: | 13 |
| TOMAHAWK: | 11 |
| ASROC: | 8 |
| NIXIE: | Yes |
| TACTASS: | Yes |

VOLUME SUMMARY (CUFT)
* INDICATES MODIFIED SSCS

| | | |
|---|---|---|
| 1 | MISSION SUPPORT | 100,464 |
| 2 | HUMAN SUPPORT | 45,201 |
| 3 | SHIP SUPPORT | 118,987 |
| 4 | SHIP MACHINERY | 131,758 |
| | TOTAL VOLUME | 396,410 |

COST ESTIMATE SUMMARY
* INDICATES MODIFIED COST

| | |
|---|---|
| COST YEAR: | 1992 |
| NUMBER OF SHIPS: | 30 |
| LEAD SHIP COST: | $741.241 MIL |
| FOURTH SHIP COST: | $666.651 MIL |
| *PAYLOAD COST: | $125.093 MIL |
| NONRECUR. COST: | $163.266 MIL |
| AVERAGE COST: | $370.402 MIL |
| LEARNING CURVE: | 92.00 % |
| HOURS @ SEA: | 2,402 |
| HOURS IN PORT: | 1,982 |
| ANNUAL O&S COST: | $10.75 MIL |

MANNING SUMMARY
(50% MANNING REDUCTION)

| | |
|---|---|
| OFFICERS | 10 |
| CHIEFS | 9 |
| ENLISTED | 70 |
| TOTAL MANNING | 89 |
| TOTAL ACCOMMODATIONS | 100 |

WARSHIP-21 SHIP DESIGN MODEL (VER 1.53) -- PAGE 2 -- 09/17/95 17:23:24

SHIP DATA FILE: CPCN2.SDF

SHIP DESCRIPTION: CPCX Option 2
NAVY OPT 2
5000 NM @ 20
SPS-49D sub for MINI SPY

DESIGN MODE: Payload Fixed

TECHNOLOGIES INCLUDED IN MODEL:

- 50% Manning Reduction
- Bow Bulb
- Fiberoptics
- Fire Zones
- High Speed Hull Form
- IR Insulation
- Lightweight Cable
- Lightweight Foundations
- Machinery Monitoring & Control
- Modular Combat System
- Orthotropic Deckhouse
- Orthotropic Decks
- Producible Ship
- Reverse Osmosis
- Stern Wedge
- URN Reduction
- Waste Heat Boilers

USER-DEFINED PAYLOAD LIST:

| DESCRIPTION | SWBS | WT(LT) | KG(FT) | KW LOAD |
|---|---|---|---|---|
| rhib | 000 | 2.00 | 20.000 | 0.00 |
| rhib | 000 | 2.00 | 20.000 | 0.00 |
| Stern Ramp | 500 | 2.00 | 15.000 | 25.00 |
| SH100 Minehunting Sonar | 700 | 1.25 | 5.000 | 6.00 |
| 40MM CIWS ADJUSTMENTS | 000 | 0.50 | 40.000 | 10.00 |
| 40MM CIWS ADJUSTMENTS | 000 | 0.50 | 40.000 | 10.00 |
| HARPOON 4 PK | 000 | 4.00 | 40.000 | 2.00 |
| HARPOON 4 PK | 000 | 4.00 | 40.000 | 2.00 |

| DESCRIPTION | SSCS | VOL(CUFT) | COST($1983) |
|---|---|---|---|
| rhib | 0.000 | 2000.00 | 5.00E+04 |
| rhib | 0.000 | 2000.00 | 5.00E+04 |
| Stern Ramp | 0.000 | 6000.00 | 2.00E+05 |
| SH100 Minehunting Sonar | 0.000 | 200.00 | 1.00E+06 |
| 40MM CIWS ADJUSTMENTS | 0.000 | 1000.00 | 2.50E+05 |
| 40MM CIWS ADJUSTMENTS | 0.000 | 1000.00 | 2.50E+05 |
| HARPOON 4 PK | 0.000 | 0.00 | 3.50E+05 |
| HARPOON 4 PK | 0.000 | 0.00 | 3.50E+05 |

WARSHIP-21 SHIP DESIGN MODEL (VER 1.53) -- PAGE 1 -- 09/17/95 17:20:56

SHIP DATA FILE: CPCN2.SDF

SHIP DESCRIPTION: CPCX Option 2
NAVY OPT 2
5000 NM @ 20
SPS-48E sub for MINI SPY

DESIGN MODE: Payload Fixed

PRINCIPAL CHARACTERISTICS

| | |
|---|---|
| LBP | 409.02 FT |
| LOA | 442.97 FT |
| BEAM | 45.45 FT |
| DRAFT TO KEEL | 13.25 FT |
| DEPTH @ STA 10 | 30.00 FT |
| GMT | 5.23 FT |
| GMT/BEAM RATIO | 0.115 |
| CP | 0.588 |
| CX | 0.785 |
| CB | 0.462 |
| L/B | 9.000 |
| B/T | 3.430 |
| DISP/LENGTH RATIO | 48 |

POWER PLANT SUMMARY

| | | |
|---|---|---|
| MAIN ENG: | GE LM-1600 ICR | |
| NO. MAIN ENG: | 1 | |
| SEP. CRUISE ENG: | MTU 16V1163 TB83 Diesel | |
| ENG. @ CRUISE: | 2 | |
| INSTALLED BHP: | 36,780 | HP |
| SUST. SPEED: | 27.03 | KTS |
| SUST. SHP: | 19,007 | HP |
| CRUISE SPEED: | 20.00 | KTS |
| CRUISE SHP: | 6,824 | HP |
| RANGE: | 5,000 | NM |

WEIGHT SUMMARY (LT)
* INDICATES MODIFIED SWBS

| | | |
|---|---|---|
| 100 | HULL STRUCTURE | 1,321 |
| 200 | PROPULSION | 303 |
| 300 | ELECTRICAL | 238 |
| 400 | COMM. & SURVEIL. | 76 |
| 500 | *AUX SYSTEMS | 521 |
| 600 | OUTFIT & FURN. | 246 |
| 700 | *ARMAMENT | 193 |
| SUM GROUPS 1-7 | | 2,898 |
| WEIGHT MARGIN | | 3 |
| LIGHTSHIP WEIGHT | | 2,901 |
| FUEL WEIGHT | | 208 |
| OTHER LOADS | | 142 |
| FULL LOAD DISP. | | 3,251 |
| FULL LOAD KG | | 19.38 FT |

ELECTRIC PLANT SUMMARY
* INDICATES MODIFIED LOAD

| | |
|---|---|
| GEN.MODEL: | 501-K34 |
| NO. GEN.: | 3 |
| INSTALLED kW: | 4,500 kW |
| *ELECTRIC LOAD: | 1,575 kW (w/Margins) |

COMBAT SYSTEM SUMMARY

| | |
|---|---|
| PRIMARY RADAR: | SPS-48E 3D |
| SECOND. RADAR: | [None] |
| COMM./CONTROL: | Medium (FFG-7) |
| SONAR: | [None] |
| HELICOPTER: | 1 SH-60B |
| GUNS: | 1 5-inch Mk 45 |
| CIWS: | 2 Phalanx |
| TORPEDOES: | 2 Mk-32 |
| SHORT RNG AAW: | [None] |
| NO. VLS CELLS: | 32 |
| STANDARD: | 13 |
| TOMAHAWK: | 11 |
| ASROC: | 8 |
| NIXIE: | Yes |
| TACTASS: | Yes |

VOLUME SUMMARY (CUFT)
* INDICATES MODIFIED SSCS

| | | |
|---|---|---|
| 1 | MISSION SUPPORT | 127,375 |
| 2 | HUMAN SUPPORT | 47,618 |
| 3 | SHIP SUPPORT | 132,509 |
| 4 | SHIP MACHINERY | 139,825 |
| TOTAL VOLUME | | 447,327 |

MANNING SUMMARY
(50% MANNING REDUCTION)

| | |
|---|---|
| OFFICERS | 10 |
| CHIEFS | 10 |
| ENLISTED | 74 |
| TOTAL MANNING | 94 |
| TOTAL ACCOMMODATIONS | 105 |

COST ESTIMATE SUMMARY
* INDICATES MODIFIED COST

| | |
|---|---|
| COST YEAR: | 1992 |
| NUMBER OF SHIPS: | 30 |
| LEAD SHIP COST: | $761.117 MIL |
| FOURTH SHIP COST: | $684.683 MIL |
| *PAYLOAD COST: | $125.093 MIL |
| NONRECUR. COST: | $168.294 MIL |
| AVERAGE COST: | $379.609 MIL |
| LEARNING CURVE: | 92.00 % |
| HOURS @ SEA: | 2,402 |
| HOURS IN PORT: | 1,982 |
| ANNUAL O&S COST: | $10.67 MIL |

WARSHIP-21 SHIP DESIGN MODEL (VER 1.53) -- PAGE 2 -- 09/17/95 17:20:58

SHIP DATA FILE: CPCN2.SDF

SHIP DESCRIPTION: CPCX Option 2

NAVY OPT 2
5000 NM @ 20
SPS-48E sub for MINI SPY

DESIGN MODE: Payload Fixed

TECHNOLOGIES INCLUDED IN MODEL:

| | |
|---|---|
| 50% Manning Reduction | Modular Combat System |
| Bow Bulb | Orthotropic Deckhouse |
| Fiberoptics | Orthotropic Decks |
| Fire Zones | Producible Ship |
| High Speed Hull Form | Reverse Osmosis |
| IR Insulation | Stern Wedge |
| Lightweight Cable | URN Reduction |
| Lightweight Foundations | Waste Heat Boilers |
| Machinery Monitoring & Control | |

USER-DEFINED PAYLOAD LIST:

| DESCRIPTION | SWBS | WT(LT) | KG(FT) | KW LOAD |
|---|---|---|---|---|
| rhib | 000 | 2.00 | 20.000 | 0.00 |
| rhib | 000 | 2.00 | 20.000 | 0.00 |
| Stern Ramp | 500 | 2.00 | 15.000 | 25.00 |
| SH100 Minehunting Sonar | 700 | 1.25 | 5.000 | 6.00 |
| 40MM CIWS ADJUSTMENTS | 000 | 0.50 | 40.000 | 10.00 |
| 40MM CIWS ADJUSTMENTS | 000 | 0.50 | 40.000 | 10.00 |
| HARPOON 4 PK | 000 | 4.00 | 40.000 | 2.00 |
| HARPOON 4 PK | 000 | 4.00 | 40.000 | 2.00 |

| DESCRIPTION | SSCS | VOL(CUFT) | COST($1983) |
|---|---|---|---|
| rhib | 0.000 | 2000.00 | 5.00E+04 |
| rhib | 0.000 | 2000.00 | 5.00E+04 |
| Stern Ramp | 0.000 | 6000.00 | 2.00E+05 |
| SH100 Minehunting Sonar | 0.000 | 200.00 | 1.00E+06 |
| 40MM CIWS ADJUSTMENTS | 0.000 | 1000.00 | 2.50E+05 |
| 40MM CIWS ADJUSTMENTS | 0.000 | 1000.00 | 2.50E+05 |
| HARPOON 4 PK | 0.000 | 0.00 | 3.50E+05 |
| HARPOON 4 PK | 0.000 | 0.00 | 3.50E+05 |

WARSHIP-21 SHIP DESIGN MODEL (VER 1.53) -- PAGE 1 -- 09/17/95 17:17:32

SHIP DATA FILE: CPCN2.SDF

SHIP DESCRIPTION: CPCX Option 2

NAVY OPT 2
5000 NM @ 20
SPY-1D sub for MINI SPY

DESIGN MODE: Payload Fixed

PRINCIPAL CHARACTERISTICS

| | |
|---|---|
| LBP | 416.87 FT |
| LOA | 451.47 FT |
| BEAM | 46.32 FT |
| DRAFT TO KEEL | 13.50 FT |
| DEPTH @ STA 10 | 30.00 FT |
| GMT | 5.55 FT |
| GMT/BEAM RATIO | 0.120 |
| CP | 0.588 |
| CX | 0.785 |
| CB | 0.462 |
| L/B | 9.000 |
| B/T | 3.430 |
| DISP/LENGTH RATIO | 48 |

POWER PLANT SUMMARY

| | | |
|---|---|---|
| MAIN ENG: | GE LM-1600 ICR | |
| NO. MAIN ENG: | 1 | |
| SEP. CRUISE ENG: | MTU 16V1163 TB83 Diesel | |
| ENG. @ CRUISE: | 2 | |
| INSTALLED BHP: | 36,780 | HP |
| SUST. SPEED: | 26.75 | KTS |
| SUST. SHP: | 19,007 | HP |
| CRUISE SPEED: | 20.00 | KTS |
| CRUISE SHP: | 7,048 | HP |
| RANGE: | 5,000 | NM |

WEIGHT SUMMARY (LT)
* INDICATES MODIFIED SWBS

| | | |
|---|---|---|
| 100 | HULL STRUCTURE | 1,357 |
| 200 | PROPULSION | 304 |
| 300 | ELECTRICAL | 239 |
| 400 | COMM. & SURVEIL. | 120 |
| 500 | *AUX SYSTEMS | 533 |
| 600 | OUTFIT & FURN. | 252 |
| 700 | *ARMAMENT | 194 |
| SUM GROUPS 1-7 | | 2,999 |
| WEIGHT MARGIN | | 3 |
| LIGHTSHIP WEIGHT | | 3,002 |
| FUEL WEIGHT | | 295 |
| OTHER LOADS | | 145 |
| FULL LOAD DISP. | | 3,442 |
| FULL LOAD KG | | 19.53 FT |

ELECTRIC PLANT SUMMARY
* INDICATES MODIFIED LOAD

| | |
|---|---|
| GEN.MODEL: | 501-K34 |
| NO. GEN.: | 3 |
| INSTALLED kW: | 4,500 kW |
| *ELECTRIC LOAD: | 2,608 kW (w/Margins) |

COMBAT SYSTEM SUMMARY

| | |
|---|---|
| PRIMARY RADAR: | Aegis (SPY-1D) |
| SECOND. RADAR: | [None] |
| COMM./CONTROL: | Medium (FFG-7) |
| SONAR: | [None] |
| HELICOPTER: | 1 SH-60B |
| GUNS: | 1 5-inch Mk 45 |
| CIWS: | 2 Phalanx |
| TORPEDOES: | 2 Mk-32 |
| SHORT RNG AAW: | [None] |
| NO. VLS CELLS: | 32 |
| STANDARD: | 13 |
| TOMAHAWK: | 11 |
| ASROC: | 8 |
| NIXIE: | Yes |
| TACTASS: | Yes |

VOLUME SUMMARY (CUFT)
* INDICATES MODIFIED SSCS

| | | |
|---|---|---|
| 1 | MISSION SUPPORT | 128,207 |
| 2 | HUMAN SUPPORT | 49,334 |
| 3 | SHIP SUPPORT | 143,622 |
| 4 | SHIP MACHINERY | 142,398 |
| TOTAL VOLUME | | 463,562 |

COST ESTIMATE SUMMARY
* INDICATES MODIFIED COST

| | |
|---|---|
| COST YEAR: | 1992 |
| NUMBER OF SHIPS: | 30 |
| LEAD SHIP COST: | $773.932 MIL |
| FOURTH SHIP COST: | $696.701 MIL |
| *PAYLOAD COST: | $125.093 MIL |
| NONRECUR. COST: | $173.161 MIL |
| AVERAGE COST: | $383.735 MIL |
| LEARNING CURVE: | 92.00 % |
| HOURS @ SEA: | 2,402 |
| HOURS IN PORT: | 1,982 |
| ANNUAL O&S COST: | $10.85 MIL |

MANNING SUMMARY
(50% MANNING REDUCTION)

| | |
|---|---|
| OFFICERS | 10 |
| CHIEFS | 10 |
| ENLISTED | 78 |
| TOTAL MANNING | 98 |
| TOTAL ACCOMMODATIONS | 110 |

```
WARSHIP-21 SHIP DESIGN MODEL (VER 1.53) -- PAGE 2 -- 09/17/95   17:17:34

SHIP DATA FILE:        CPCN2.SDF

SHIP DESCRIPTION:      CPCX Option 2
NAVY OPT 2
5000 NM @ 20
SPY-1D sub for MINI SPY

DESIGN MODE:           Payload Fixed
```

TECHNOLOGIES INCLUDED IN MODEL:

- 50% Manning Reduction
- Bow Bulb
- Fiberoptics
- Fire Zones
- High Speed Hull Form
- IR Insulation
- Lightweight Cable
- Lightweight Foundations
- Machinery Monitoring & Control
- Modular Combat System
- Orthotropic Deckhouse
- Orthotropic Decks
- Producible Ship
- Reverse Osmosis
- Stern Wedge
- URN Reduction
- Waste Heat Boilers

USER-DEFINED PAYLOAD LIST:

| DESCRIPTION | SWBS | WT(LT) | KG(FT) | KW LOAD |
|---|---|---|---|---|
| rhib | 000 | 2.00 | 20.000 | 0.00 |
| rhib | 000 | 2.00 | 20.000 | 0.00 |
| Stern Ramp | 500 | 2.00 | 15.000 | 25.00 |
| SH100 Minehunting Sonar | 700 | 1.25 | 5.000 | 6.00 |
| 40MM CIWS ADJUSTMENTS | 000 | 0.50 | 40.000 | 10.00 |
| 40MM CIWS ADJUSTMENTS | 000 | 0.50 | 40.000 | 10.00 |
| HARPOON 4 PK | 000 | 4.00 | 40.000 | 2.00 |
| HARPOON 4 PK | 000 | 4.00 | 40.000 | 2.00 |

| DESCRIPTION | SSCS | VOL(CUFT) | COST($1983) |
|---|---|---|---|
| rhib | 0.000 | 2000.00 | 5.00E+04 |
| rhib | 0.000 | 2000.00 | 5.00E+04 |
| Stern Ramp | 0.000 | 6000.00 | 2.00E+05 |
| SH100 Minehunting Sonar | 0.000 | 200.00 | 1.00E+06 |
| 40MM CIWS ADJUSTMENTS | 0.000 | 1000.00 | 2.50E+05 |
| 40MM CIWS ADJUSTMENTS | 0.000 | 1000.00 | 2.50E+05 |
| HARPOON 4 PK | 0.000 | 0.00 | 3.50E+05 |
| HARPOON 4 PK | 0.000 | 0.00 | 3.50E+05 |

WARSHIP-21 SHIP DESIGN MODEL (VER 1.53) -- PAGE 1 -- 09/17/95 17:12:05

SHIP DATA FILE: CPCN3.SDF

SHIP DESCRIPTION: CPCX Option 3

NAVY OPT 3
5000 NM @ 20

DESIGN MODE: Payload Fixed

PRINCIPAL CHARACTERISTICS

| | |
|---|---|
| LBP | 390.29 FT |
| LOA | 422.68 FT |
| BEAM | 43.37 FT |
| DRAFT TO KEEL | 12.64 FT |
| DEPTH @ STA 10 | 30.00 FT |
| GMT | 5.48 FT |
| GMT/BEAM RATIO | 0.126 |
| CP | 0.588 |
| CX | 0.785 |
| CB | 0.462 |
| L/B | 9.000 |
| B/T | 3.430 |
| DISP/LENGTH RATIO | 48 |

WEIGHT SUMMARY (LT)
* INDICATES MODIFIED SWBS

| | | |
|---|---|---|
| 100 | HULL STRUCTURE | 1,160 |
| 200 | PROPULSION | 300 |
| 300 | ELECTRICAL | 231 |
| 400 | COMM. & SURVEIL. | 55 |
| 500 | *AUX SYSTEMS | 465 |
| 600 | OUTFIT & FURN. | 215 |
| 700 | *ARMAMENT | 120 |
| SUM GROUPS 1-7 | | 2,547 |
| WEIGHT MARGIN | | 3 |
| LIGHTSHIP WEIGHT | | 2,549 |
| FUEL WEIGHT | | 205 |
| OTHER LOADS | | 70 |
| FULL LOAD DISP. | | 2,825 |
| FULL LOAD KG | | 17.99 FT |

VOLUME SUMMARY (CUFT)
* INDICATES MODIFIED SSCS

| | | |
|---|---|---|
| 1 | MISSION SUPPORT | 87,361 |
| 2 | HUMAN SUPPORT | 42,300 |
| 3 | SHIP SUPPORT | 111,979 |
| 4 | SHIP MACHINERY | 127,426 |
| TOTAL VOLUME | | 369,066 |

MANNING SUMMARY
(50% MANNING REDUCTION)

| | |
|---|---|
| OFFICERS | 8 |
| CHIEFS | 8 |
| ENLISTED | 69 |
| TOTAL MANNING | 85 |
| TOTAL ACCOMMODATIONS | 95 |

POWER PLANT SUMMARY

| | |
|---|---|
| MAIN ENG: | GE LM-1600 ICR |
| NO. MAIN ENG: | 1 |
| SEP. CRUISE ENG: | MTU 16V1163 TB83 Diesel |
| ENG. @ CRUISE: | 2 |
| INSTALLED BHP: | 36,780 HP |
| SUST. SPEED: | 27.49 KTS |
| SUST. SHP: | 19,007 HP |
| CRUISE SPEED: | 20.00 KTS |
| CRUISE SHP: | 6,300 HP |
| RANGE: | 5,000 NM |

ELECTRIC PLANT SUMMARY
* INDICATES MODIFIED LOAD

| | |
|---|---|
| GEN.MODEL: | 501-K34 |
| NO. GEN.: | 3 |
| INSTALLED kW: | 4,500 kW |
| *ELECTRIC LOAD: | 1,546 kW (w/Margins) |

COMBAT SYSTEM SUMMARY

| | |
|---|---|
| PRIMARY RADAR: | SPS-49 V(5) 2D |
| SECOND. RADAR: | [None] |
| COMM./CONTROL: | Medium (FFG-7) |
| SONAR: | [None] |
| HELICOPTER: | 1 SH-60B |
| GUNS: | 1 5-inch Mk 45 |
| CIWS: | 2 Phalanx |
| TORPEDOES: | 2 Mk-32 |
| SHORT RNG AAW: | 1 21-cell RAM |
| NO. VLS CELLS: | 0 |
| STANDARD: | 0 |
| TOMAHAWK: | 0 |
| ASROC: | 0 |
| NIXIE: | Yes |
| TACTASS: | Yes |

COST ESTIMATE SUMMARY
* INDICATES MODIFIED COST

| | |
|---|---|
| COST YEAR: | 1992 |
| NUMBER OF SHIPS: | 30 |
| LEAD SHIP COST: | $760.976 MIL |
| FOURTH SHIP COST: | $681.816 MIL |
| *PAYLOAD COST: | $146.093 MIL |
| NONRECUR. COST: | $156.867 MIL |
| AVERAGE COST: | $392.242 MIL |
| LEARNING CURVE: | 92.00 % |
| HOURS @ SEA: | 2,402 |
| HOURS IN PORT: | 1,982 |
| ANNUAL O&S COST: | $11.06 MIL |

WARSHIP-21 SHIP DESIGN MODEL (VER 1.53) -- PAGE 2 -- 09/17/95 17:12:07

SHIP DATA FILE: CPCN3.SDF

SHIP DESCRIPTION: CPCX Option 3

NAVY OPT 3
5000 NM @ 20

DESIGN MODE: Payload Fixed

TECHNOLOGIES INCLUDED IN MODEL:

50% Manning Reduction
Bow Bulb
Fiberoptics
Fire Zones
High Speed Hull Form
IR Insulation
Lightweight Cable
Lightweight Foundations
Machinery Monitoring & Control
Modular Combat System
Orthotropic Deckhouse
Orthotropic Decks
Producible Ship
Reverse Osmosis
Stern Wedge
URN Reduction
Waste Heat Boilers

USER-DEFINED PAYLOAD LIST:

| DESCRIPTION | SWBS | WT(LT) | KG(FT) | KW LOAD |
|---|---|---|---|---|
| rhib | 000 | 2.00 | 20.000 | 0.00 |
| rhib | 000 | 2.00 | 20.000 | 0.00 |
| Stern Ramp | 500 | 2.00 | 15.000 | 25.00 |
| SH100 Minehunting Sonar | 700 | 1.25 | 5.000 | 6.00 |
| 40MM CIWS ADJUSTMENTS | 000 | 0.50 | 40.000 | 10.00 |
| 40MM CIWS ADJUSTMENTS | 000 | 0.50 | 40.000 | 10.00 |
| HARPOON 4 PK | 000 | 4.00 | 40.000 | 2.00 |
| HARPOON 4 PK | 000 | 4.00 | 40.000 | 2.00 |
| THAWK IN ABL 4PK | 000 | 10.00 | 35.000 | 2.00 |
| THAWK IN ABL 4PK | 000 | 10.00 | 35.000 | 2.00 |

| DESCRIPTION | SSCS | VOL(CUFT) | COST($1983) |
|---|---|---|---|
| rhib | 0.000 | 2000.00 | 5.00E+04 |
| rhib | 0.000 | 2000.00 | 5.00E+04 |
| Stern Ramp | 0.000 | 6000.00 | 2.00E+05 |
| SH100 Minehunting Sonar | 0.000 | 200.00 | 1.00E+06 |
| 40MM CIWS ADJUSTMENTS | 0.000 | 1000.00 | 2.50E+05 |
| 40MM CIWS ADJUSTMENTS | 0.000 | 1000.00 | 2.50E+05 |
| HARPOON 4 PK | 0.000 | 0.00 | 3.50E+05 |
| HARPOON 4 PK | 0.000 | 0.00 | 3.50E+05 |
| THAWK IN ABL 4PK | 0.000 | 0.00 | 5.00E+06 |
| THAWK IN ABL 4PK | 0.000 | 0.00 | 5.00E+06 |

WARSHIP-21 SHIP DESIGN MODEL (VER 1.53) -- PAGE 1 -- 09/17/95 16:33:36

SHIP DATA FILE: CPCCG1.SDF

CG OPTION 1

SHIP DESCRIPTION: CPCX Option 4

DESIGN MODE: Payload Fixed

PRINCIPAL CHARACTERISTICS

| | |
|---|---|
| LBP | 424.40 FT |
| LOA | 459.63 FT |
| BEAM | 47.16 FT |
| DRAFT TO KEEL | 13.75 FT |
| DEPTH @ STA 10 | 30.00 FT |
| GMT | 7.28 FT |
| GMT/BEAM RATIO | 0.154 |
| CP | 0.588 |
| CX | 0.785 |
| CB | 0.462 |
| L/B | 9.000 |
| B/T | 3.430 |
| DISP/LENGTH RATIO | 48 |

POWER PLANT SUMMARY

| | | |
|---|---|---|
| MAIN ENG: | GE LM-1600 ICR | |
| NO. MAIN ENG: | 1 | |
| SEP. CRUISE ENG: | MTU 16V1163 TB83 Diesel | |
| ENG. @ CRUISE: | 2 | |
| INSTALLED BHP: | 36,780 | HP |
| SUST. SPEED: | 26.58 | KTS |
| SUST. SHP: | 19,007 | HP |
| CRUISE SPEED: | 14.00 | KTS |
| CRUISE SHP: | 2,531 | HP |
| RANGE: | 8,000 | NM |

WEIGHT SUMMARY (LT)
* INDICATES MODIFIED SWBS

| | | |
|---|---|---|
| 100 | HULL STRUCTURE | 1,345 |
| 200 | PROPULSION | 305 |
| 300 | ELECTRICAL | 239 |
| 400 | COMM. & SURVEIL. | 133 |
| 500 | *AUX SYSTEMS | 534 |
| 600 | OUTFIT & FURN. | 252 |
| 700 | *ARMAMENT | 54 |
| SUM GROUPS 1-7 | | 2,863 |
| WEIGHT MARGIN | | 3 |
| LIGHTSHIP WEIGHT | | 2,866 |
| FUEL WEIGHT | | 680 |
| OTHER LOADS | | 86 |
| FULL LOAD DISP. | | 3,632 |
| FULL LOAD KG | | 18.25 FT |

ELECTRIC PLANT SUMMARY
* INDICATES MODIFIED LOAD

| | |
|---|---|
| GEN.MODEL: | 501-K34 |
| NO. GEN.: | 3 |
| INSTALLED kW: | 4,500 kW |
| *ELECTRIC LOAD: | 2,651 kW (w/Margins) |

COMBAT SYSTEM SUMMARY

| | |
|---|---|
| PRIMARY RADAR: | Aegis (SPY-1D) |
| SECOND. RADAR: | [None] |
| COMM./CONTROL: | Medium (FFG-7) |
| SONAR: | [None] |
| HELICOPTER: | 1 SH-60B |
| GUNS: | 1 76mm |
| CIWS: | 2 Phalanx |
| TORPEDOES: | [None] |
| SHORT RNG AAW: | 1 21-cell RAM |
| NO. VLS CELLS: | 0 |
| STANDARD: | 0 |
| TOMAHAWK: | 0 |
| ASROC: | 0 |
| NIXIE: | Yes |
| TACTASS: | No |

VOLUME SUMMARY (CUFT)
* INDICATES MODIFIED SSCS

| | | |
|---|---|---|
| 1 | MISSION SUPPORT | 94,819 |
| 2 | HUMAN SUPPORT | 50,220 |
| 3 | SHIP SUPPORT | 173,459 |
| 4 | SHIP MACHINERY | 141,896 |
| TOTAL VOLUME | | 460,393 |

COST ESTIMATE SUMMARY
* INDICATES MODIFIED COST

| | |
|---|---|
| COST YEAR: | 1995 |
| NUMBER OF SHIPS: | 100 |
| LEAD SHIP COST: | $779.260 MIL |
| FOURTH SHIP COST: | $702.344 MIL |
| *PAYLOAD COST: | $126.318 MIL |
| NONRECUR. COST: | $177.877 MIL |
| AVERAGE COST: | $382.449 MIL |
| LEARNING CURVE: | 93.00 % |
| HOURS @ SEA: | 3,000 |
| HOURS IN PORT: | 1,982 |
| ANNUAL O&S COST: | $11.12 MIL |

MANNING SUMMARY
(50% MANNING REDUCTION)

| | |
|---|---|
| OFFICERS | 11 |
| CHIEFS | 10 |
| ENLISTED | 78 |
| TOTAL MANNING | 99 |
| TOTAL ACCOMMODATIONS | 111 |

WARSHIP-21 SHIP DESIGN MODEL (VER 1.53) -- PAGE 2 -- 09/17/95 16:33:38

SHIP DATA FILE: CPCCG1.SDF

CG OPTION 1

SHIP DESCRIPTION: CPCX Option 4

DESIGN MODE: Payload Fixed

TECHNOLOGIES INCLUDED IN MODEL:

- 50% Manning Reduction
- Bow Bulb
- Fiberoptics
- Fire Zones
- High Speed Hull Form
- IR Insulation
- Lightweight Cable
- Lightweight Foundations
- Machinery Monitoring & Control
- Modular Combat System
- Orthotropic Deckhouse
- Orthotropic Decks
- Producible Ship
- Reverse Osmosis
- Stern Wedge
- URN Reduction
- Waste Heat Boilers

USER-DEFINED PAYLOAD LIST:

| DESCRIPTION | SWBS | WT(LT) | KG(FT) | KW LOAD |
|---|---|---|---|---|
| rhib | 000 | 2.00 | 20.000 | 0.00 |
| rhib | 000 | 2.00 | 20.000 | 0.00 |
| MSB | 000 | 2.50 | 30.000 | 0.00 |
| MSB Davits | 000 | 4.00 | 35.000 | 25.00 |
| Stern Ramp | 500 | 2.00 | 15.000 | 25.00 |
| MSB | 000 | 2.50 | 30.000 | 0.00 |
| MSB Davits | 000 | 4.00 | 35.000 | 25.00 |
| Crane | 500 | 4.00 | 30.000 | 25.00 |
| SH100 Minehunting Sonar | 700 | 1.25 | 5.000 | 6.00 |

| DESCRIPTION | SSCS | VOL(CUFT) | COST($1983) |
|---|---|---|---|
| rhib | 0.000 | 2000.00 | 5.00E+04 |
| rhib | 0.000 | 2000.00 | 5.00E+04 |
| MSB | 0.000 | 2500.00 | 7.50E+04 |
| MSB Davits | 0.000 | 3000.00 | 1.00E+05 |
| Stern Ramp | 0.000 | 6000.00 | 2.00E+05 |
| MSB | 0.000 | 2500.00 | 7.50E+04 |
| MSB Davits | 0.000 | 3000.00 | 1.00E+05 |
| Crane | 0.000 | 1500.00 | 7.50E+04 |
| SH100 Minehunting Sonar | 0.000 | 200.00 | 1.00E+06 |

WARSHIP-21 SHIP DESIGN MODEL (VER 1.53) -- PAGE 1 -- 09/17/95 16:52:36

SHIP DATA FILE: CPCCG2.SDF

SHIP DESCRIPTION: CPCX Option 5
COAST GUARD opt 2
sps49 sub for mini SPY

DESIGN MODE: Payload Fixed

PRINCIPAL CHARACTERISTICS

| | |
|---|---|
| LBP | 399.03 FT |
| LOA | 432.14 FT |
| BEAM | 44.34 FT |
| DRAFT TO KEEL | 12.93 FT |
| DEPTH @ STA 10 | 30.00 FT |
| GMT | 7.11 FT |
| GMT/BEAM RATIO | 0.160 |
| CP | 0.588 |
| CX | 0.785 |
| CB | 0.462 |
| L/B | 9.000 |
| B/T | 3.430 |
| DISP/LENGTH RATIO | 48 |

POWER PLANT SUMMARY

| | |
|---|---|
| MAIN ENG: | GE LM-1600 ICR |
| NO. MAIN ENG: | 1 |
| SEP. CRUISE ENG: | MTU 16V1163 TB83 Diesel |
| ENG. @ CRUISE: | 2 |
| INSTALLED BHP: | 36,780 HP |
| SUST. SPEED: | 27.15 KTS |
| SUST. SHP: | 19,007 HP |
| CRUISE SPEED: | 14.00 KTS |
| CRUISE SHP: | 2,270 HP |
| RANGE: | 8,000 NM |

WEIGHT SUMMARY (LT)
* INDICATES MODIFIED SWBS

| | | |
|---|---|---|
| 100 | HULL STRUCTURE | 1,142 |
| 200 | PROPULSION | 302 |
| 300 | ELECTRICAL | 231 |
| 400 | COMM. & SURVEIL. | 68 |
| 500 | *AUX SYSTEMS | 463 |
| 600 | OUTFIT & FURN. | 213 |
| 700 | *ARMAMENT | 44 |
| | SUM GROUPS 1-7 | 2,462 |
| | WEIGHT MARGIN | 2 |
| | LIGHTSHIP WEIGHT | 2,465 |
| | FUEL WEIGHT | 484 |
| | OTHER LOADS | 70 |
| | FULL LOAD DISP. | 3,019 |
| | FULL LOAD KG | 16.89 FT |

ELECTRIC PLANT SUMMARY
* INDICATES MODIFIED LOAD

| | |
|---|---|
| GEN.MODEL: | 501-K34 |
| NO. GEN.: | 3 |
| INSTALLED kW: | 4,500 kW |
| *ELECTRIC LOAD: | 1,615 kW (w/Margins) |

COMBAT SYSTEM SUMMARY

| | |
|---|---|
| PRIMARY RADAR: | SPS-49 V(5) 2D |
| SECOND. RADAR: | [None] |
| COMM./CONTROL: | Medium (FFG-7) |
| SONAR: | [None] |
| HELICOPTER: | 1 SH-60B |
| GUNS: | [None] |
| CIWS: | 2 Phalanx |
| TORPEDOES: | [None] |
| SHORT RNG AAW: | 1 21-cell RAM |
| NO. VLS CELLS: | 0 |
| STANDARD: | 0 |
| TOMAHAWK: | 0 |
| ASROC: | 0 |
| NIXIE: | Yes |
| TACTASS: | No |

VOLUME SUMMARY (CUFT)
* INDICATES MODIFIED SSCS

| | | |
|---|---|---|
| 1 | MISSION SUPPORT | 59,619 |
| 2 | HUMAN SUPPORT | 43,484 |
| 3 | SHIP SUPPORT | 132,218 |
| 4 | SHIP MACHINERY | 126,236 |
| | TOTAL VOLUME | 361,557 |

MANNING SUMMARY
(50% MANNING REDUCTION)

| | |
|---|---|
| OFFICERS | 10 |
| CHIEFS | 9 |
| ENLISTED | 66 |
| TOTAL MANNING | 85 |
| TOTAL ACCOMMODATIONS | 95 |

COST ESTIMATE SUMMARY
* INDICATES MODIFIED COST

| | |
|---|---|
| COST YEAR: | 1992 |
| NUMBER OF SHIPS: | 30 |
| LEAD SHIP COST: | $689.573 MIL |
| FOURTH SHIP COST: | $622.654 MIL |
| *PAYLOAD COST: | $104.818 MIL |
| NONRECUR. COST: | $162.165 MIL |
| AVERAGE COST: | $333.126 MIL |
| LEARNING CURVE: | 92.00 % |
| HOURS @ SEA: | 2,402 |
| HOURS IN PORT: | 1,982 |
| ANNUAL O&S COST: | $10.97 MIL |

WARSHIP-21 SHIP DESIGN MODEL (VER 1.53) -- PAGE 2 -- 09/17/95 16:52:38

SHIP DATA FILE: CPCCG2.SDF

SHIP DESCRIPTION: CPCX Option 5
COAST GUARD opt 2
sps49 sub for mini SPY

DESIGN MODE: Payload Fixed

TECHNOLOGIES INCLUDED IN MODEL:

- 50% Manning Reduction
- Bow Bulb
- Fiberoptics
- Fire Zones
- High Speed Hull Form
- IR Insulation
- Lightweight Cable
- Lightweight Foundations
- Machinery Monitoring & Control
- Modular Combat System
- Orthotropic Deckhouse
- Orthotropic Decks
- Producible Ship
- Reverse Osmosis
- Stern Wedge
- URN Reduction
- Waste Heat Boilers

USER-DEFINED PAYLOAD LIST:

| DESCRIPTION | SWBS | WT(LT) | KG(FT) | KW LOAD |
|---|---|---|---|---|
| rhib | 000 | 2.00 | 20.000 | 0.00 |
| rhib | 000 | 2.00 | 20.000 | 0.00 |
| MSB | 000 | 2.50 | 30.000 | 0.00 |
| MSB Davits | 000 | 4.00 | 35.000 | 25.00 |
| Stern Ramp | 500 | 2.00 | 15.000 | 25.00 |
| MSB | 000 | 2.50 | 30.000 | 0.00 |
| MSB Davits | 000 | 4.00 | 35.000 | 25.00 |
| Crane | 500 | 4.00 | 30.000 | 25.00 |
| SH100 Minehunting Sonar | 700 | 1.25 | 5.000 | 6.00 |
| 40MM CIWS ADJUSTMENTS | 000 | 0.50 | 40.000 | 10.00 |
| 40MM CIWS ADJUSTMENTS | 000 | 0.50 | 40.000 | 10.00 |

| DESCRIPTION | SSCS | VOL(CUFT) | COST($1983) |
|---|---|---|---|
| rhib | 0.000 | 2000.00 | 5.00E+04 |
| rhib | 0.000 | 2000.00 | 5.00E+04 |
| MSB | 0.000 | 2500.00 | 7.50E+04 |
| MSB Davits | 0.000 | 3000.00 | 1.00E+05 |
| Stern Ramp | 0.000 | 6000.00 | 2.00E+05 |
| MSB | 0.000 | 2500.00 | 7.50E+04 |
| MSB Davits | 0.000 | 3000.00 | 1.00E+05 |
| Crane | 0.000 | 1500.00 | 7.50E+04 |
| SH100 Minehunting Sonar | 0.000 | 200.00 | 1.00E+06 |
| 40MM CIWS ADJUSTMENTS | 0.000 | 1000.00 | 2.50E+05 |
| 40MM CIWS ADJUSTMENTS | 0.000 | 1000.00 | 2.50E+05 |

WARSHIP-21 SHIP DESIGN MODEL (VER 1.53) -- PAGE 1 -- 09/17/95 17:35:20

SHIP DATA FILE: CPCCG2.SDF

SHIP DESCRIPTION: CPCX Option 5
COAST GUARD opt 2
SPS-48E sub for Mini SPY

DESIGN MODE: Payload Fixed

PRINCIPAL CHARACTERISTICS

| | |
|---|---|
| LBP | 407.75 FT |
| LOA | 441.59 FT |
| BEAM | 45.31 FT |
| DRAFT TO KEEL | 13.21 FT |
| DEPTH @ STA 10 | 30.00 FT |
| GMT | 6.78 FT |
| GMT/BEAM RATIO | 0.150 |
| CP | 0.588 |
| CX | 0.785 |
| CB | 0.462 |
| L/B | 9.000 |
| B/T | 3.430 |
| DISP/LENGTH RATIO | 48 |

POWER PLANT SUMMARY

| | | |
|---|---|---|
| MAIN ENG: | GE LM-1600 ICR | |
| NO. MAIN ENG: | 1 | |
| SEP. CRUISE ENG: | MTU 16V1163 TB83 Diesel | |
| ENG. @ CRUISE: | 2 | |
| INSTALLED BHP: | 36,780 | HP |
| SUST. SPEED: | 27.08 | KTS |
| SUST. SHP: | 19,007 | HP |
| CRUISE SPEED: | 14.00 | KTS |
| CRUISE SHP: | 2,358 | HP |
| RANGE: | 8,000 | NM |

WEIGHT SUMMARY (LT)
* INDICATES MODIFIED SWBS

| | | |
|---|---|---|
| 100 | HULL STRUCTURE | 1,247 |
| 200 | PROPULSION | 303 |
| 300 | ELECTRICAL | 235 |
| 400 | COMM. & SURVEIL. | 83 |
| 500 | *AUX SYSTEMS | 501 |
| 600 | OUTFIT & FURN. | 233 |
| 700 | *ARMAMENT | 45 |
| | SUM GROUPS 1-7 | 2,648 |
| | WEIGHT MARGIN | 3 |
| | LIGHTSHIP WEIGHT | 2,651 |
| | FUEL WEIGHT | 493 |
| | OTHER LOADS | 78 |
| | FULL LOAD DISP. | 3,221 |
| | FULL LOAD KG | 17.75 FT |

ELECTRIC PLANT SUMMARY
* INDICATES MODIFIED LOAD

| | |
|---|---|
| GEN.MODEL: | 501-K34 |
| NO. GEN.: | 3 |
| INSTALLED kW: | 4,500 kW |
| *ELECTRIC LOAD: | 1,654 kW (w/Margins) |

COMBAT SYSTEM SUMMARY

| | |
|---|---|
| PRIMARY RADAR: | SPS-48E 3D |
| SECOND. RADAR: | [None] |
| COMM./CONTROL: | Medium (FFG-7) |
| SONAR: | [None] |
| HELICOPTER: | 1 SH-60B |
| GUNS: | [None] |
| CIWS: | 2 Phalanx |
| TORPEDOES: | [None] |
| SHORT RNG AAW: | 1 21-cell RAM |
| NO. VLS CELLS: | 0 |
| STANDARD: | 0 |
| TOMAHAWK: | 0 |
| ASROC: | 0 |
| NIXIE: | Yes |
| TACTASS: | No |

VOLUME SUMMARY (CUFT)
* INDICATES MODIFIED SSCS

| | | |
|---|---|---|
| 1 | MISSION SUPPORT | 86,567 |
| 2 | HUMAN SUPPORT | 45,901 |
| 3 | SHIP SUPPORT | 146,305 |
| 4 | SHIP MACHINERY | 134,417 |
| | TOTAL VOLUME | 413,190 |

COST ESTIMATE SUMMARY
* INDICATES MODIFIED COST

| | |
|---|---|
| COST YEAR: | 1992 |
| NUMBER OF SHIPS: | 30 |
| LEAD SHIP COST: | $710.496 MIL |
| FOURTH SHIP COST: | $641.650 MIL |
| *PAYLOAD COST: | $104.818 MIL |
| NONRECUR. COST: | $167.513 MIL |
| AVERAGE COST: | $342.757 MIL |
| LEARNING CURVE: | 92.00 % |
| HOURS @ SEA: | 2,402 |
| HOURS IN PORT: | 1,982 |
| ANNUAL O&S COST: | $10.86 MIL |

MANNING SUMMARY
(50% MANNING REDUCTION)

| | |
|---|---|
| OFFICERS | 10 |
| CHIEFS | 10 |
| ENLISTED | 70 |
| TOTAL MANNING | 90 |
| TOTAL ACCOMMODATIONS | 101 |

WARSHIP-21 SHIP DESIGN MODEL (VER 1.53) -- PAGE 2 -- 09/17/95 17:35:22

SHIP DATA FILE: CPCCG2.SDF

SHIP DESCRIPTION: CPCX Option 5
COAST GUARD opt 2
SPS-48E sub for Mini SPY

DESIGN MODE: Payload Fixed

TECHNOLOGIES INCLUDED IN MODEL:

- 50% Manning Reduction
- Bow Bulb
- Fiberoptics
- Fire Zones
- High Speed Hull Form
- IR Insulation
- Lightweight Cable
- Lightweight Foundations
- Machinery Monitoring & Control
- Modular Combat System
- Orthotropic Deckhouse
- Orthotropic Decks
- Producible Ship
- Reverse Osmosis
- Stern Wedge
- URN Reduction
- Waste Heat Boilers

USER-DEFINED PAYLOAD LIST:

| DESCRIPTION | SWBS | WT(LT) | KG(FT) | KW LOAD |
|---|---|---|---|---|
| rhib | 000 | 2.00 | 20.000 | 0.00 |
| rhib | 000 | 2.00 | 20.000 | 0.00 |
| MSB | 000 | 2.50 | 30.000 | 0.00 |
| MSB Davits | 000 | 4.00 | 35.000 | 25.00 |
| Stern Ramp | 500 | 2.00 | 15.000 | 25.00 |
| MSB | 000 | 2.50 | 30.000 | 0.00 |
| MSB Davits | 000 | 4.00 | 35.000 | 25.00 |
| Crane | 500 | 4.00 | 30.000 | 25.00 |
| SH100 Minehunting Sonar | 700 | 1.25 | 5.000 | 6.00 |
| 40MM CIWS ADJUSTMENTS | 000 | 0.50 | 40.000 | 10.00 |
| 40MM CIWS ADJUSTMENTS | 000 | 0.50 | 40.000 | 10.00 |

| DESCRIPTION | SSCS | VOL(CUFT) | COST($1983) |
|---|---|---|---|
| rhib | 0.000 | 2000.00 | 5.00E+04 |
| rhib | 0.000 | 2000.00 | 5.00E+04 |
| MSB | 0.000 | 2500.00 | 7.50E+04 |
| MSB Davits | 0.000 | 3000.00 | 1.00E+05 |
| Stern Ramp | 0.000 | 6000.00 | 2.00E+05 |
| MSB | 0.000 | 2500.00 | 7.50E+04 |
| MSB Davits | 0.000 | 3000.00 | 1.00E+05 |
| Crane | 0.000 | 1500.00 | 7.50E+04 |
| SH100 Minehunting Sonar | 0.000 | 200.00 | 1.00E+06 |
| 40MM CIWS ADJUSTMENTS | 0.000 | 1000.00 | 2.50E+05 |
| 40MM CIWS ADJUSTMENTS | 0.000 | 1000.00 | 2.50E+05 |

WARSHIP-21 SHIP DESIGN MODEL (VER 1.53) -- PAGE 1 -- 09/17/95 16:57:19

SHIP DATA FILE: CPCCG2.SDF

SHIP DESCRIPTION: CPCX Option 5
COAST GUARD opt 2
SPY-1D sub for Mini SPY

DESIGN MODE: Payload Fixed

PRINCIPAL CHARACTERISTICS

| | |
|---|---|
| LBP | 422.32 FT |
| LOA | 457.38 FT |
| BEAM | 46.92 FT |
| DRAFT TO KEEL | 13.68 FT |
| DEPTH @ STA 10 | 30.00 FT |
| GMT | 7.40 FT |
| GMT/BEAM RATIO | 0.158 |
| CP | 0.588 |
| CX | 0.785 |
| CB | 0.462 |
| L/B | 9.000 |
| B/T | 3.430 |
| DISP/LENGTH RATIO | 48 |

WEIGHT SUMMARY (LT)
* INDICATES MODIFIED SWBS

| | | |
|---|---|---|
| 100 | HULL STRUCTURE | 1,318 |
| 200 | PROPULSION | 305 |
| 300 | ELECTRICAL | 238 |
| 400 | COMM. & SURVEIL. | 131 |
| 500 | *AUX SYSTEMS | 525 |
| 600 | OUTFIT & FURN. | 246 |
| 700 | *ARMAMENT | 46 |
| SUM GROUPS 1-7 | | 2,808 |
| WEIGHT MARGIN | | 3 |
| LIGHTSHIP WEIGHT | | 2,811 |
| FUEL WEIGHT | | 684 |
| OTHER LOADS | | 83 |
| FULL LOAD DISP. | | 3,579 |
| FULL LOAD KG | | 18.01 FT |

VOLUME SUMMARY (CUFT)
* INDICATES MODIFIED SSCS

| | | |
|---|---|---|
| 1 | MISSION SUPPORT | 88,285 |
| 2 | HUMAN SUPPORT | 48,476 |
| 3 | SHIP SUPPORT | 170,216 |
| 4 | SHIP MACHINERY | 139,727 |
| TOTAL VOLUME | | 446,704 |

MANNING SUMMARY
(50% MANNING REDUCTION)

| | |
|---|---|
| OFFICERS | 10 |
| CHIEFS | 10 |
| ENLISTED | 76 |
| TOTAL MANNING | 96 |
| TOTAL ACCOMMODATIONS | 108 |

POWER PLANT SUMMARY

| | |
|---|---|
| MAIN ENG: | GE LM-1600 ICR |
| NO. MAIN ENG: | 1 |
| SEP. CRUISE ENG: | MTU 16V1163 TB83 Diesel |
| ENG. @ CRUISE: | 2 |
| INSTALLED BHP: | 36,780 HP |
| SUST. SPEED: | 26.55 KTS |
| SUST. SHP: | 19,007 HP |
| CRUISE SPEED: | 14.00 KTS |
| CRUISE SHP: | 2,509 HP |
| RANGE: | 8,000 NM |

ELECTRIC PLANT SUMMARY
* INDICATES MODIFIED LOAD

| | |
|---|---|
| GEN.MODEL: | 501-K34 |
| NO. GEN.: | 3 |
| INSTALLED kW: | 4,500 kW |
| *ELECTRIC LOAD: | 2,675 kW (w/Margins) |

COMBAT SYSTEM SUMMARY

| | |
|---|---|
| PRIMARY RADAR: | Aegis (SPY-1D) |
| SECOND. RADAR: | [None] |
| COMM./CONTROL: | Medium (FFG-7) |
| SONAR: | [None] |
| HELICOPTER: | 1 SH-60B |
| GUNS: | [None] |
| CIWS: | 2 Phalanx |
| TORPEDOES: | [None] |
| SHORT RNG AAW: | 1 21-cell RAM |
| NO. VLS CELLS: | 0 |
| STANDARD: | 0 |
| TOMAHAWK: | 0 |
| ASROC: | 0 |
| NIXIE: | Yes |
| TACTASS: | No |

COST ESTIMATE SUMMARY
* INDICATES MODIFIED COST

| | |
|---|---|
| COST YEAR: | 1992 |
| NUMBER OF SHIPS: | 30 |
| LEAD SHIP COST: | $734.005 MIL |
| FOURTH SHIP COST: | $663.727 MIL |
| *PAYLOAD COST: | $104.818 MIL |
| NONRECUR. COST: | $176.574 MIL |
| AVERAGE COST: | $350.177 MIL |
| LEARNING CURVE: | 92.00 % |
| HOURS @ SEA: | 2,402 |
| HOURS IN PORT: | 1,982 |
| ANNUAL O&S COST: | $11.03 MIL |

WARSHIP-21 SHIP DESIGN MODEL (VER 1.53) -- PAGE 2 -- 09/17/95 16:57:21

SHIP DATA FILE: CPCCG2.SDF

SHIP DESCRIPTION: CPCX Option 5
COAST GUARD opt 2
SPY-1D sub for Mini SPY

DESIGN MODE: Payload Fixed

TECHNOLOGIES INCLUDED IN MODEL:

50% Manning Reduction
Bow Bulb
Fiberoptics
Fire Zones
High Speed Hull Form
IR Insulation
Lightweight Cable
Lightweight Foundations
Machinery Monitoring & Control
Modular Combat System
Orthotropic Deckhouse
Orthotropic Decks
Producible Ship
Reverse Osmosis
Stern Wedge
URN Reduction
Waste Heat Boilers

USER-DEFINED PAYLOAD LIST:

| DESCRIPTION | SWBS | WT(LT) | KG(FT) | KW LOAD |
|---|---|---|---|---|
| rhib | 000 | 2.00 | 20.000 | 0.00 |
| rhib | 000 | 2.00 | 20.000 | 0.00 |
| MSB | 000 | 2.50 | 30.000 | 0.00 |
| MSB Davits | 000 | 4.00 | 35.000 | 25.00 |
| Stern Ramp | 500 | 2.00 | 15.000 | 25.00 |
| MSB | 000 | 2.50 | 30.000 | 0.00 |
| MSB Davits | 000 | 4.00 | 35.000 | 25.00 |
| Crane | 500 | 4.00 | 30.000 | 25.00 |
| SH100 Minehunting Sonar | 700 | 1.25 | 5.000 | 6.00 |
| 40MM CIWS ADJUSTMENTS | 000 | 0.50 | 40.000 | 10.00 |
| 40MM CIWS ADJUSTMENTS | 000 | 0.50 | 40.000 | 10.00 |

| DESCRIPTION | SSCS | VOL(CUFT) | COST($1983) |
|---|---|---|---|
| rhib | 0.000 | 2000.00 | 5.00E+04 |
| rhib | 0.000 | 2000.00 | 5.00E+04 |
| MSB | 0.000 | 2500.00 | 7.50E+04 |
| MSB Davits | 0.000 | 3000.00 | 1.00E+05 |
| Stern Ramp | 0.000 | 6000.00 | 2.00E+05 |
| MSB | 0.000 | 2500.00 | 7.50E+04 |
| MSB Davits | 0.000 | 3000.00 | 1.00E+05 |
| Crane | 0.000 | 1500.00 | 7.50E+04 |
| SH100 Minehunting Sonar | 0.000 | 200.00 | 1.00E+06 |
| 40MM CIWS ADJUSTMENTS | 0.000 | 1000.00 | 2.50E+05 |
| 40MM CIWS ADJUSTMENTS | 0.000 | 1000.00 | 2.50E+05 |

WARSHIP-21 SHIP DESIGN MODEL (VER 1.53) -- PAGE 1 -- 09/17/95 17:00:15

SHIP DATA FILE: CPCCG3.SDF

SHIP DESCRIPTION: CPCX Option 6
CG OPTION 3

DESIGN MODE: Payload Fixed

PRINCIPAL CHARACTERISTICS

| | |
|---|---|
| LBP | 394.91 FT |
| LOA | 427.68 FT |
| BEAM | 43.88 FT |
| DRAFT TO KEEL | 12.79 FT |
| DEPTH @ STA 10 | 30.00 FT |
| GMT | 7.20 FT |
| GMT/BEAM RATIO | 0.164 |
| CP | 0.588 |
| CX | 0.785 |
| CB | 0.462 |
| L/B | 9.000 |
| B/T | 3.430 |
| DISP/LENGTH RATIO | 48 |

POWER PLANT SUMMARY

| | | |
|---|---|---|
| MAIN ENG: | GE LM-1600 ICR | |
| NO. MAIN ENG: | 1 | |
| SEP. CRUISE ENG: | MTU 16V1163 TB83 Diesel | |
| ENG. @ CRUISE: | 2 | |
| INSTALLED BHP: | 36,780 | HP |
| SUST. SPEED: | 27.31 | KTS |
| SUST. SHP: | 19,007 | HP |
| CRUISE SPEED: | 14.00 | KTS |
| CRUISE SHP: | 2,229 | HP |
| RANGE: | 8,000 | NM |

WEIGHT SUMMARY (LT)
* INDICATES MODIFIED SWBS

| | | |
|---|---|---|
| 100 | HULL STRUCTURE | 1,103 |
| 200 | PROPULSION | 301 |
| 300 | ELECTRICAL | 229 |
| 400 | COMM. & SURVEIL. | 64 |
| 500 | *AUX SYSTEMS | 449 |
| 600 | OUTFIT & FURN. | 204 |
| 700 | *ARMAMENT | 35 |
| SUM GROUPS 1-7 | | 2,385 |
| WEIGHT MARGIN | | 2 |
| LIGHTSHIP WEIGHT | | 2,387 |
| FUEL WEIGHT | | 473 |
| OTHER LOADS | | 65 |
| FULL LOAD DISP. | | 2,926 |
| FULL LOAD KG | | 16.55 FT |

ELECTRIC PLANT SUMMARY
* INDICATES MODIFIED LOAD

| | |
|---|---|
| GEN.MODEL: | 501-K34 |
| NO. GEN.: | 3 |
| INSTALLED kW: | 4,500 kW |
| *ELECTRIC LOAD: | 1,568 kW (w/Margins) |

COMBAT SYSTEM SUMMARY

| | |
|---|---|
| PRIMARY RADAR: | SPS-49 V(5) 2D |
| SECOND. RADAR: | [None] |
| COMM./CONTROL: | Medium (FFG-7) |
| SONAR: | [None] |
| HELICOPTER: | 1 SH-60B |
| GUNS: | [None] |
| CIWS: | 1 Phalanx |
| TORPEDOES: | [None] |
| SHORT RNG AAW: | 1 21-cell RAM |
| NO. VLS CELLS: | 0 |
| STANDARD: | 0 |
| TOMAHAWK: | 0 |
| ASROC: | 0 |
| NIXIE: | Yes |
| TACTASS: | No |

VOLUME SUMMARY (CUFT)
* INDICATES MODIFIED SSCS

| | | |
|---|---|---|
| 1 | MISSION SUPPORT | 54,214 |
| 2 | HUMAN SUPPORT | 39,025 |
| 3 | SHIP SUPPORT | 126,613 |
| 4 | SHIP MACHINERY | 123,324 |
| TOTAL VOLUME | | 343,176 |

COST ESTIMATE SUMMARY
* INDICATES MODIFIED COST

| | |
|---|---|
| COST YEAR: | 1992 |
| NUMBER OF SHIPS: | 30 |
| LEAD SHIP COST: | $670.937 MIL |
| FOURTH SHIP COST: | $606.279 MIL |
| *PAYLOAD COST: | $99.693 MIL |
| NONRECUR. COST: | $159.661 MIL |
| AVERAGE COST: | $322.029 MIL |
| LEARNING CURVE: | 92.00 % |
| HOURS @ SEA: | 2,402 |
| HOURS IN PORT: | 1,982 |
| ANNUAL O&S COST: | $10.91 MIL |

MANNING SUMMARY
(50% MANNING REDUCTION)

| | |
|---|---|
| OFFICERS | 8 |
| CHIEFS | 7 |
| ENLISTED | 63 |
| TOTAL MANNING | 78 |
| TOTAL ACCOMMODATIONS | 87 |

WARSHIP-21 SHIP DESIGN MODEL (VER 1.53) -- PAGE 2 -- 09/17/95 17:00:17

SHIP DATA FILE: CPCCG3.SDF

SHIP DESCRIPTION: CPCX Option 6

CG OPTION 3

DESIGN MODE: Payload Fixed

TECHNOLOGIES INCLUDED IN MODEL:

- 50% Manning Reduction
- Bow Bulb
- Fiberoptics
- Fire Zones
- High Speed Hull Form
- IR Insulation
- Lightweight Cable
- Lightweight Foundations
- Machinery Monitoring & Control
- Modular Combat System
- Orthotropic Deckhouse
- Orthotropic Decks
- Producible Ship
- Reverse Osmosis
- Stern Wedge
- URN Reduction
- Waste Heat Boilers

USER-DEFINED PAYLOAD LIST:

| DESCRIPTION | SWBS | WT(LT) | KG(FT) | KW LOAD |
|---|---|---|---|---|
| rhib | 000 | 2.00 | 20.000 | 0.00 |
| rhib | 000 | 2.00 | 20.000 | 0.00 |
| MSB | 000 | 2.50 | 30.000 | 0.00 |
| MSB Davits | 000 | 4.00 | 35.000 | 25.00 |
| Stern Ramp | 500 | 2.00 | 15.000 | 25.00 |
| Crane | 500 | 4.00 | 30.000 | 25.00 |
| SH100 Minehunting Sonar | 700 | 1.25 | 5.000 | 6.00 |
| 40MM CIWS ADJUSTMENTS | 000 | 0.50 | 40.000 | 10.00 |

| DESCRIPTION | SSCS | VOL(CUFT) | COST($1983) |
|---|---|---|---|
| rhib | 0.000 | 2000.00 | 5.00E+04 |
| rhib | 0.000 | 2000.00 | 5.00E+04 |
| MSB | 0.000 | 2500.00 | 7.50E+04 |
| MSB Davits | 0.000 | 3000.00 | 1.00E+05 |
| Stern Ramp | 0.000 | 6000.00 | 2.00E+05 |
| Crane | 0.000 | 1500.00 | 7.50E+04 |
| SH100 Minehunting Sonar | 0.000 | 200.00 | 1.00E+06 |
| 40MM CIWS ADJUSTMENTS | 0.000 | 1000.00 | 2.50E+05 |

# APPENDIX K

## SELF DEFENSE DATA

## Summary

Self-defense capabilities of CPCX variants were evaluated against a variety of inbound missile threats. The summary of "Self-Defense Efficiencies" of each CPCX variant against respective threats was shown in table (K-1). The self-defense efficiency was defined as the product of all the individual kill probabilities for each defensive system used in particular engagement. Individual defensive system kill probabilities were provided by the faculty and were also shown in table (K-2). Self-defense efficiencies were determined for individual as well as combined inbound threat missiles, using threat scenarios described in the Operational Requirements Document.

The model used to determine self-defense efficiencies was the "Engagement Sequence Diagram", an example of which was shown on page (K-5). The self-defense engagement model incorporated delays that occur due to human decision making such as reaction and evaluation times. Incorporation of actual operational doctrine the ship might use in detecting and engaging threats of a particular scenario was beyond the scope of this design project.

A summary of the number of self-defense weapons expended against various threats was shown in table (K-3). Characteristics of threat missiles A-1, A-2, etc. were identical to those shown in Appendix E.

## Engagement Sequence Diagram Description

A description of the Engagement Sequence Diagram shown on page (K-5), used to depict a CPCX Navy 1 Variant defense against a single inbound sea skimming A-3 missile, is as follows:

1. The plot has axes of the inbound missile's time to impact vs. range from ship. The diagonal line from the upper left to lower right represents the range at any time after launch of the inbound missile, in this case the A-3, traveling at mach 0.9.

2. The inbound A-3 missile is detected at a range of 25 km, based on information found in Appendix E - Radar Calculations.

3. After a ten-second reaction time, the first self-defense anti-missile weapon in the Navy 1 Variant's arsenal, an Enhanced Sea Sparrow is fired. The slope of the solid line labeled "ESS" represents the Sea Sparrow's outbound speed. The Sea Sparrow's projected impact with the A-3 is represented by point "1".

4. After ten seconds of evaluation time, the second self-defense weapon, a Rolling Air Frame (RAM) missile, is fired. The projected impact point of this missile is represented by point "2".

5. In a similar manner, after an evaluation time, the second RAM is fired with projected impact point "3".

6. The self-defense efficiency of this engagement is therefore the product of individual kill probabilities for each defensive system used, as shown in the following equation. The CIWS point defense and Chaff decoy systems' kill probabilities were

included also.

$$\begin{aligned} P_k &= 1-(1-0.7)(1-0.7)(1-0.7)(1-0.5)(1-0.4) \\ &= 0.992 \end{aligned}$$

This self-defense efficiency was entered in table (K-1) for variant "Navy 1" and single missile threat "A-3".

7. The numbers of self-defense weapons expended for this engagement (one ESS, two RAM, CIWS, and CHAFF) were entered in the appropriate blocks in table (K-3).

# ENGAGEMENT SEQUENCE DIAGRAM

NAVY VARIANT 1 - MISSILE A-3

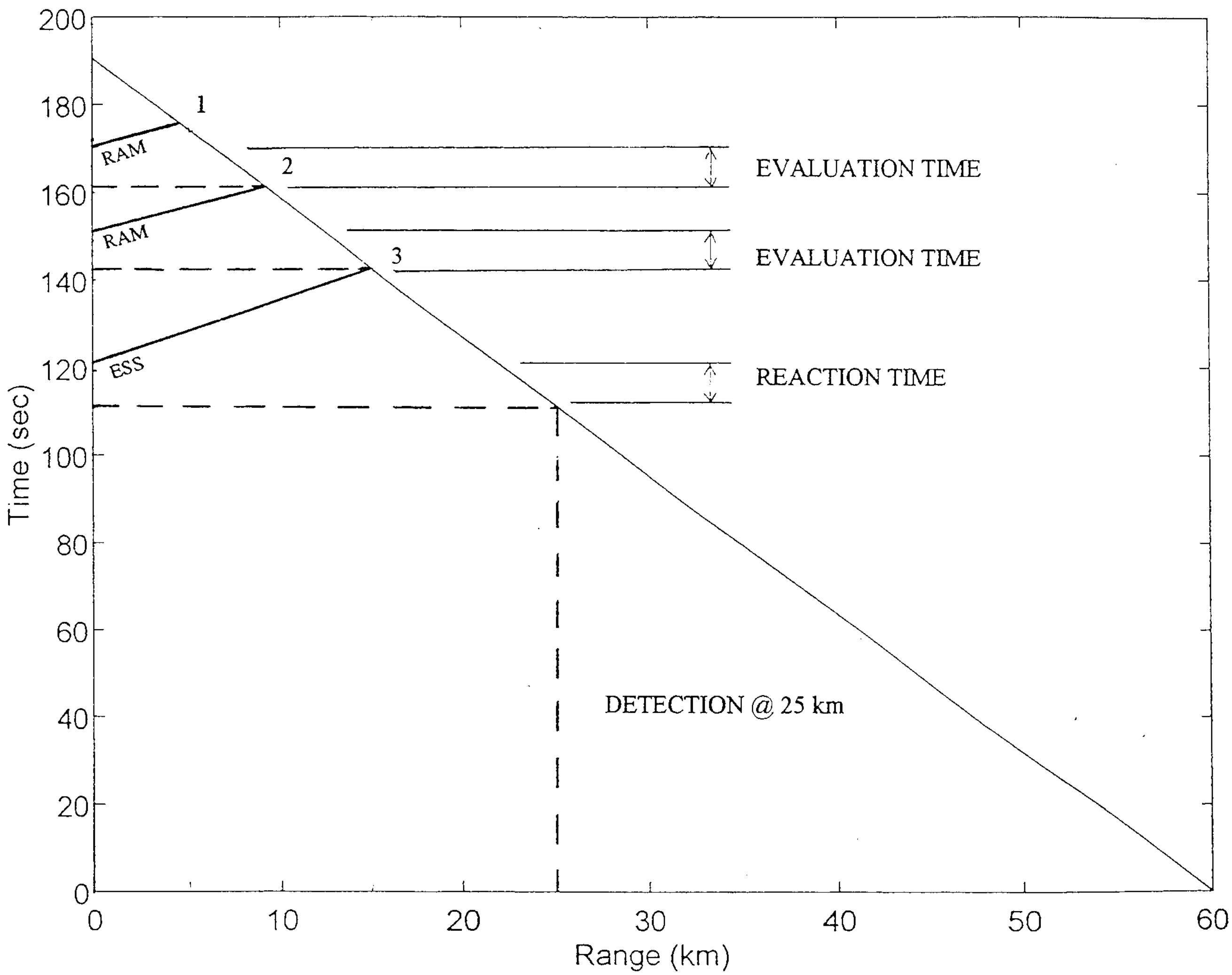


Table K-1: Self-Defense Efficiencies

| | | VARIANT | | | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| | NAVY | NAVY | NAVY | CG | CG | CG |
| **SINGLE MISSILE THREAT** | 1 | 2 | 3 | 1 | 2 | 3 |
| A-1 | 0.996 | 0.997 | 0.989 | 0.989 | 0.989 | 0.874 |
| A-2 | 0.986 | 0.952 | 0.700 | 0.973 | 0.973 | 0.910 |
| A-3 | 0.992 | 0.992 | 0.992 | 0.992 | 0.992 | 0.910 |
| A-4 | 0.998 | 0.998 | 0.998 | 0.995 | 0.998 | 0.998 |
| M-2 | 0.995 | 0.995 | 0.943 | 0.943 | 0.943 | 0.881 |
| | | | | | | |
| | | | | | | |
| **COMBINED MISSILE THREAT** | | | | | | |
| THREE A-3'S | | | | | | |
| (similar bearings) | 0.993 | 0.993 | 0.987 | | | |
| TWO A-3'S and ONE A-1 | | | | | | |
| (different bearings) | 0.991 | 0.992 | 0.936 | | | |

Table K-2: Individual Defensive System Kill Probabilities (provided by faculty)

| Defensive Missile System | A-1 | A-2 | A-3 | A-4 | M-1 | M-2 |
|---|---|---|---|---|---|---|
| SM2-MR | 0.6 | 0.8 | 0.7 | 0.7 | | 0.7 |
| ESS | 0.6 | 0.8 | 0.7 | 0.7 | | 0.7 |
| RAM | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 |
| STINGER | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 |
| CIWS/40 MM GUN | 0.3 | 0.5 | 0.5 | 0.5 | 0.2 | 0.3 |
| SLQ-32/CHAFF/DECOYS | 0.4 | 0.4 | 0.4 | 0.4 | 0.3 | 0.1 |

Table K-3: Self-Defense Weapons Expended Against Various Threats

| | | | SINGLE A-1 MISSILE | | | | |
|---|---|---|---|---|---|---|---|
| SHIP OPTION | SM2 | ESS | RAM | STINGER | CIWS | 40MM | CHAFF |
| NAVY 1 | 2 | 2 | 0 | 0 | X | | X |
| NAVY 2 | 2 | 1 | 1 | 0 | | X | X |
| NAVY 3 | 0 | 0 | 3 | 0 | | X | X |
| CG 1 | 0 | 0 | 3 | 0 | X | | X |
| CG 2 | 0 | 0 | 3 | 0 | | X | X |
| CG 3 | 0 | 0 | 0 | 1 | | X | X |

| | | | SINGLE A-2 MISSILE | | | | |
|---|---|---|---|---|---|---|---|
| SHIP OPTION | SM2 | ESS | RAM | STINGER | CIWS | 40MM | CHAFF |
| NAVY 1 | 0 | 2 | 0 | 0 | X | | X |
| NAVY 2 | 0 | 2 | 1 | 0 | | X | X |
| NAVY 3 | 0 | 0 | 0 | 0 | | X | X |
| CG 1 | 0 | 0 | 2 | 0 | X | | X |
| CG 2 | 0 | 0 | 2 | 0 | | X | X |
| CG 3 | 0 | 0 | 0 | 2 | | X | X |

| | | | SINGLE A-3 MISSILE | | | | |
|---|---|---|---|---|---|---|---|
| SHIP OPTION | SM2 | ESS | RAM | STINGER | CIWS | 40MM | CHAFF |
| NAVY 1 | 0 | 1 | 2 | 0 | X | | X |
| NAVY 2 | 0 | 0 | 0 | 0 | | X | X |
| NAVY 3 | 0 | 0 | 3 | 0 | | X | X |
| CG 1 | 0 | 0 | 3 | 0 | X | | X |
| CG 2 | 0 | 0 | 3 | 0 | | X | X |
| CG 3 | 0 | 0 | 0 | 2 | | X | X |

| | | | SINGLE A-4 MISSILE | | | | |
|---|---|---|---|---|---|---|---|
| SHIP OPTION | SM2 | ESS | RAM | STINGER | CIWS | 40MM | CHAFF |
| NAVY 1 | 1 | 3 | 0 | 0 | X | | X |
| NAVY 2 | 1 | 3 | 0 | 0 | | X | X |
| NAVY 3 | 0 | 0 | 4 | 0 | | X | X |
| CG 1 | 0 | 0 | 4 | 0 | X | | X |
| CG 2 | 0 | 0 | 4 | 0 | | X | X |
| CG 3 | 0 | 0 | 0 | 2 | | X | X |

| | | | SINGLE M-2 MISSILE | | | | |
|---|---|---|---|---|---|---|---|
| SHIP OPTION | SM2 | ESS | RAM | STINGER | CIWS | 40MM | CHAFF |
| NAVY 1 | 2 | 2 | 0 | 0 | X | | X |
| NAVY 2 | 2 | 2 | 0 | 0 | | X | X |
| NAVY 3 | 0 | 0 | 2 | 0 | | X | X |
| CG 1 | 0 | 0 | 2 | 0 | X | | X |
| CG 2 | 0 | 0 | 2 | 0 | | X | X |
| CG 3 | 0 | 0 | 0 | 2 | | X | X |

| | | THREE A-3 MISSILES ON SIMILIAR BEARINGS | | | | | |
|---|---|---|---|---|---|---|---|
| SHIP OPTION | SM2 | ESS | RAM | STINGER | CIWS | 40MM | CHAFF |
| NAVY 1 | 2 | 2 | 2 | 0 | X | | X |
| NAVY 2 | 2 | 2 | 2 | 0 | | X | X |
| NAVY 3 | 0 | 0 | 3 | 0 | | X | X |
| CG 1 | | | | | | | |
| CG 2 | | | | | | | |
| CG 3 | | | | | | | |

| | | TWO A-3'S, ONE A-1 MISSILE ON DIFFERENT BEARINGS | | | | | |
|---|---|---|---|---|---|---|---|
| SHIP OPTION | SM2 | ESS | RAM | STINGER | CIWS | 40MM | CHAFF |
| NAVY 1 | 2 | 5 | 5 | 0 | X | | X |
| NAVY 2 | 2 | 10 | 0 | 0 | | X | X |
| NAVY 3 | 0 | 0 | 9 | 0 | | X | X |
| CG 1 | | | | | | | |
| CG 2 | | | | | | | |
| CG 3 | | | | | | | |

# APPENDIX L

## MEASURES OF EFFECTIVENESS

# SUMMARY

The measures of effectiveness were equated to show the relationship between each whole ship option in several designated mission areas. A weighing factor was then used to show the relative importance of each mission area and the overall MOE was determined. The following tables show the MOE calculations for each whole ship option.

Table L-1: Navy Variant MOE Calculations

Table L-2: Coast Guard MOE Calculations

| | USN Variant | | |
|---|---|---|---|
| | Option 1 | Option 2 | Option 3 |
| | | | |
| Number of strike missles = | 9 | 9 | 4 |
| Range of missle (km) = | 2500 | 2500 | 2500 |
| Ability to target = | 0.95 | 0.95 | 0.95 |
| Circle error probability (m) = | 5 | 5 | 5 |
| Ship cost (M$) = | 430 | 380 | 340 |
| Number of missles needed for kill = | 1 | 1 | 1 |
| **Strike effectiveness =** | 0.994186 | 1.125 | 0.558824 |
| | | | |
| | | | |
| Defense efficiency = | 0.992 | 0.992 | 0.992 |
| Probability of kill given hit for ship = | 0.4 | 0.4 | 0.4 |
| Number of air self defense missles = | 46 | 25 | 21 |
| **Air engagement effectiveness =** | 0.198326 | 0.242105 | 0.274353 |
| | | | |
| | | | |
| Number of ASROC = | 4 | 4 | 0 |
| Range of ASROC (m) = | 10000 | 10000 | |
| Number of SVTT = | 6 | 6 | 6 |
| Range of SVTT (m) = | 2000 | 2000 | 2000 |
| Effectiveness of torpedo (MK50) = | 0.7 | 0.7 | 0.7 |
| **Sub-surface engagement effec. =** | 0.846512 | 0.957895 | 0.247059 |
| | | | |
| | | | |
| Number of guns = | 1 | 1 | 1 |
| Range of gun fire (m) = | 30000 | 26000 | 26000 |
| Weight of round (kg) = | 4.7 | 3.5 | 3.5 |
| Number of rounds = | 280 | 400 | 400 |
| Circle error probability (m) = | 120 | 100 | 100 |
| **NGFS effectiveness =** | 0.765116 | 0.957895 | 1.070588 |
| | | | |
| | | | |
| Search width - ship (nm) = | 35 | 25 | 15 |
| Velocity - ship (knots) = | 14 | 14 | 14 |
| Time of search - ship (hrs) = | 24 | 24 | 24 |
| Search area - ship (sq-nm) = | 10000 | 10000 | 10000 |
| Search width - helo (nm) = | 50 | 50 | 50 |
| Velocity - helo (knots) = | 100 | 100 | 100 |
| Time of search - helo (hrs) = | 4 | 4 | 4 |
| Search area - helo (sq-nm) = | 10000 | 10000 | 10000 |
| **Patrol area effectiveness =** | 0.160812 | 0.14955 | 0.116438 |

**Table L-1: Navy Variant MOE Calculations**

| | | | |
|---|---|---|---|
| | | | |
| | | | |
| Conversion factor 1 = | 0.75 | 0.75 | 0.75 |
| Conversion factor 2 = | 0.75 | 0.75 | 0.75 |
| Conversion factor 3 = | 1 | 0.75 | 0.75 |
| Conversion factor 4 = | 0.25 | 0.25 | 0.25 |
| Conversion factor 5 = | 0.75 | 0.75 | 0.75 |
| Conversion factor 6 = | 0.25 | 0.25 | 0.25 |
| **Convertability effectiveness =** | 0.263672 | 0.197754 | 0.197754 |
| | | | |
| | | | |
| Displacement (LT) = | 4000 | 3600 | 3200 |
| Stack exhaust temp. (C) = | 150 | 150 | 150 |
| Machinery plant noise (dB) = | 155 | 155 | 155 |
| **Ship signature effectiveness =** | 0.250063 | 0.314406 | 0.395319 |
| | | | |
| | | | |
| Numbr of boarding parties = | 2 | 2 | 2 |
| Number of boats = | 2 | 2 | 2 |
| Availability of boats = | 0.9 | 0.9 | 0.9 |
| **Boarding effectiveness =** | 0.837209 | 0.947368 | 1.058824 |
| | | | |
| | | | |
| Strike weighting factor = | 1 | 1 | 1 |
| Air engagement weighting factor = | 1 | 1 | 1 |
| Sub-surface weighting factor = | 1 | 1 | 1 |
| NGFS weighting factor = | 1 | 1 | 1 |
| Patrol area weighting factor = | 0.8 | 0.8 | 0.8 |
| Convertability weighting factor = | 0.4 | 0.4 | 0.4 |
| Ship signature weighting factor = | 1 | 1 | 1 |
| Boarding weighting factor = | 0.5 | 0.5 | 0.5 |
| **Overall variant effectiveness =** | 5.566236 | 6.163862 | 5.233905 |

**Table L-1: Navy Variant MOE Calculations**

| | USCG Variant | | |
|---|---|---|---|
| | Option 1 | Option 2 | Option 3 |
| | | | |
| Ship cost (M$) = | 380 | 340 | 320 |
| Defense efficiency = | 0.992 | 0.992 | 0.91 |
| Probability of kill given hit for ship = | 0.4 | 0.4 | 0.4 |
| Number of air self defense missles = | 21 | 21 | 4 |
| **Air engagement effectiveness =** | 0.245474 | 0.274353 | 0.2675 |
| | | | |
| | | | |
| Search width - ship (nm) = | 30 | 25 | 20 |
| Velocity - ship (knots) = | 14 | 14 | 14 |
| Time of search - ship (hrs) = | 24 | 24 | 24 |
| Search area - ship (sq-nm) = | 10000 | 10000 | 10000 |
| Search width - helo (nm) = | 50 | 50 | 50 |
| Velocity - helo (knots) = | 100 | 100 | 100 |
| Time of search - helo (hrs) = | 4 | 4 | 4 |
| Search area - helo (sq-nm) = | 10000 | 10000 | 10000 |
| **Patrol area effectiveness =** | 0.167119 | 0.167144 | 0.152911 |
| | | | |
| | | | |
| Conversion factor 1 = | 0.75 | 0.75 | 0.75 |
| Conversion factor 2 = | 0.75 | 0.75 | 0.75 |
| Conversion factor 3 = | 1 | 0.75 | 0.75 |
| Conversion factor 4 = | 0.25 | 0.25 | 0.25 |
| Conversion factor 5 = | 0.75 | 0.75 | 0.75 |
| Conversion factor 6 = | 0.25 | 0.25 | 0.25 |
| **Convertability effectiveness =** | 0.263672 | 0.197754 | 0.197754 |
| | | | |
| | | | |
| Displacement (LT) = | 3500 | 3200 | 3000 |
| Stack exhaust temp. (C) = | 150 | 150 | 150 |
| Machinery plant noise (dB) = | 155 | 155 | 155 |
| **Ship signature effectiveness =** | 0.323389 | 0.395319 | 0.448029 |
| | | | |
| | | | |
| Number of boarding parties = | 2 | 2 | 2 |
| Number of boats = | 4 | 4 | 3 |
| Availability of boats = | 0.9 | 0.9 | 0.9 |
| **Boarding effectiveness =** | 1.894737 | 2.117647 | 1.6875 |
| | | | |
| | | | |
| Air engagement weighting factor = | 1 | 1 | 1 |
| Patrol area weighting factor = | 1 | 1 | 1 |
| Convertability weighting factor = | 1 | 1 | 1 |
| Ship signature weighting factor = | 0.5 | 0.5 | 0.5 |
| Boarding weighting factor = | 1 | 1 | 1 |
| **Overall variant effectiveness =** | 4.173298 | 4.216945 | 3.961856 |

**Table L-2: Coast Guard Variant MOE Calculations**

# APPENDIX M

## TANK DATA

## SUMMARY

The software tool used to design the tanks, their geometries, and model their contents, was General Hydrostatics (GHS), by Creative Systems. GHS's Tank Maker module is a user-driven tank modeler. It uses coordinate (top, bottom, forward end, aft end, width) data input by the user, along with appropriate characteristics (contents, permeability, hull fitting) to specify where in the hull the tank is, how much it holds (volume) and how much the contents weigh. Tank Maker also computes soundings for the tanks, allowing the user to calculate the stability (from within the parent program, GHS) for various tank loads.

Several inherent inaccuracies are present in the model at this time. These are due to lack of sufficient detail in the actual hull structure, for computing tank boundaries and permeabilities. The values used were estimated based on information at time of modeling (offsets for hull, and bulkhead locations). A more detailed analysis based on the detailed design of the hull structure is required and is the next logical step in the tank modeling.

Page M-3 contains a summary of the various tanks and their capacities for both versions (Navy and Coast Guard) of the CPCX.

Page M-4 is a graphical representation of the Navy version tanks.

Page M-5 lists the longitudinal location of each tank (Navy), relative to the forward perpendicular.

Page M-6 is a graphical representation of the Coast Guard version tanks.

Page M-7 lists the longitudinal location of each tank (Coast Guard), relative to the forward perpendicular.

## Navy and Coast Guard Tanks

| DFM Tankage | Percent Capacity 95% | 100% |
|---|---|---|
| 2.S | 1227 | 1292 |
| 2.P | 1227 | 1292 |
| 3.S | 2198 | 2314 |
| 3.P | 2198 | 2314 |
| 5.S | 2743 | 2887 |
| 5.P | 2743 | 2887 |
| 6I.S | 5951 | 6264 |
| 6I.P | 5951 | 6264 |
| 6.S | 614 | 646 |
| 6.P | 614 | 646 |
| 7.S | 2692 | 2834 |
| 7.P | 2692 | 2834 |
| 7I.S | 9545 | 10047 |
| 7I.P | 9545 | 10047 |
| 8.S | 3355 | 3532 |
| 8.P | 3355 | 3532 |
| 8I.S | 8301 | 8738 |
| 8I.P | 8301 | 8738 |
| 10.S | 1565 | 1647 |
| 10.P | 1565 | 1647 |
| 10I.S | 7090 | 7463 |
| 10I.P | 7090 | 7463 |
| 12.S | 13074 | 13762 |
| 12.P | 13074 | 13762 |
| 13.S | 10034 | 10562 |
| 13.P | 10034 | 10562 |
| Total Tankage | 136,777 Gal | 143,976 Gal |
| Wgt of fuel | 443.26 Lton | 466.59 Lton |

| Coast Guard added tanks | | |
|---|---|---|
| 14.C | 4821 | 5075 |
| 15.S | 4821 | 5075 |
| 15.P | 4821 | 5075 |
| 16.S | 4821 | 5075 |
| 16.P | 4821 | 5075 |
| 17.C | 9256 | 9743 |
| 18.C | 3863 | 4066 |
| Total Tankage | 174,001 Gal | 183,160 Gal |
| Wgt of fuel | 563.9 Lton | 593.58 Lton |

| Ballast Water (Peak Tank) | Percent Capacity 95% | 100% |
|---|---|---|
| 1.C | 2121 | 2233 |
| Total Tankage | 2121 Gal | 2233 Gal |
| Wgt of ballast water | 8.10 Lton | 8.53 Lton |

| LUBE OIL | Percent Capacity 95% | 100% |
|---|---|---|
| 5.C | 2654 | 2794 |
| Total Tankage | 2,654 Gal | 2,794 Gal |
| Wgt of lube oil | 9.14 Lton | 9.62 Lton |

| POTABLE WATER | Percent Capacity 95% | 100% |
|---|---|---|
| 4.S | 3133 | 3298 |
| 4.P | 3133 | 3298 |
| Total Tankage | 6,266 Gal | 6,596 Gal |
| Wgt of potable water | 23.35 Lton | 24.58 Lton |

| WASTE OIL | Percent Capacity 95% | 100% |
|---|---|---|
| 11.C | 3014 | 3173 |
| Total Tankage | 3,014 Gal | 3,173 Gal |
| Wgt of waste oil | 10.67 Lton | 11.23 Lton |

| JP-5 AVIATION FUEL | Percent Capacity 95% | 100% |
|---|---|---|
| 9I.S | 8123 | 8550 |
| 9I.S | 8123 | 8550 |
| 9.S | 3077 | 3239 |
| 9.P | 3077 | 3239 |
| Total Tankage | 22,399 Gal | 23,578 Gal |
| Wgt of JP-5 | 67.77 Lton | 71.34 Lton |

TANK SUMMARY

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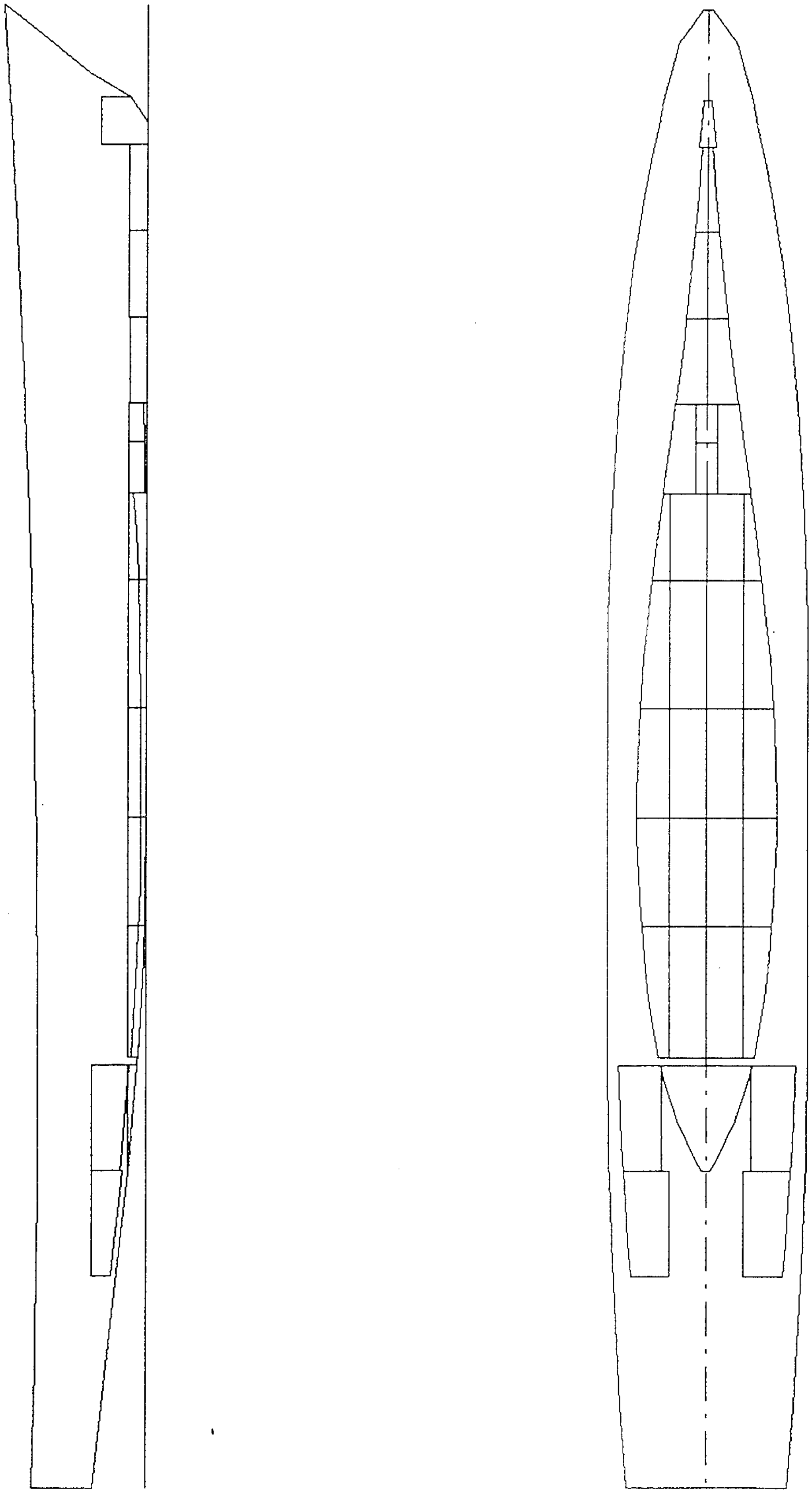
GHS-GHS/PM 2.18 CPCX



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GHS-GHS/PM 2.18 CPCX

Comments

Offsets derived from SHCP data.

| Part Name | Class | Description | Location | Volume |
|---|---|---|---|---|
| HULL | HULL | | 18.36f to 380.00a | |
| TANK1.C | TANK | | 6.50a to 18.80a | 298.500 |
| TANK2.S | TANK | | 18.80a to 42.50a | 172.666 |
| TANK2.P | TANK | | 18.80a to 42.50a | 172.666 |
| TANK3.S | TANK | | 42.50a to 65.50a | 309.295 |
| TANK3.P | TANK | | 42.50a to 65.50a | 309.295 |
| TANK5.S | TANK | | 88.50a to 112.10a | 385.975 |
| TANK5.P | TANK | | 88.50a to 112.10a | 385.975 |
| TANK5.C | TANK | | 98.50a to 112.10a | 373.464 |
| TANK7.S | TANK | | 135.70a to 170.24a | 378.919 |
| TANK7.P | TANK | | 135.70a to 170.24a | 378.919 |
| TANK7I.S | TANK | | 135.70a to 170.24a | 1343.13 |
| TANK7I.P | TANK | | 135.70a to 170.24a | 1343.13 |
| TANK8.S | TANK | | 170.24a to 199.40a | 472.232 |
| TANK8.P | TANK | | 170.24a to 199.40a | 472.232 |
| TANK8I.S | TANK | | 170.24a to 199.40a | 1168.17 |
| TANK8I.P | TANK | | 170.24a to 199.40a | 1168.17 |
| TANK10.S | TANK | | 228.90a to 264.32a | 220.209 |
| TANK10.P | TANK | | 228.90a to 264.32a | 220.209 |
| TANK10I.S | TANK | | 228.90a to 264.32a | 997.696 |
| TANK10I.P | TANK | | 228.90a to 264.32a | 997.696 |
| TANK4.S | TANK | | 65.50a to 88.50a | 440.828 |
| TANK4.P | TANK | | 65.50a to 88.50a | 440.828 |
| TANK6I.S | TANK | | 112.10a to 135.70a | 837.379 |
| TANK6I.P | TANK | | 112.10a to 135.70a | 837.379 |
| TANK6.S | TANK | | 112.10a to 135.70a | 86.364 |
| TANK6.P | TANK | | 112.10a to 135.70a | 86.364 |
| TANK11.C | TANK | | 266.32a to 294.50a | 424.105 |
| TANK12.S | TANK | | 266.32a to 294.50a | 1839.76 |
| TANK12.P | TANK | | 266.32a to 294.50a | 1839.76 |
| TANK13.S | TANK | | 294.50a to 323.30a | 1411.90 |
| TANK9I.S | TANK | | 199.40a to 228.90a | 1143.06 |
| TANK9I.P | TANK | | 199.40a to 228.90a | 1143.06 |
| TANK9.S | TANK | | 199.40a to 228.90a | 432.944 |
| TANK9.P | TANK | | 199.40a to 228.90a | 432.944 |
| TANK13.P | TANK | | 294.50a to 323.30a | 1411.90 |

Locations in Feet fwd/aft of the origin. Volumes in cubic Feet.

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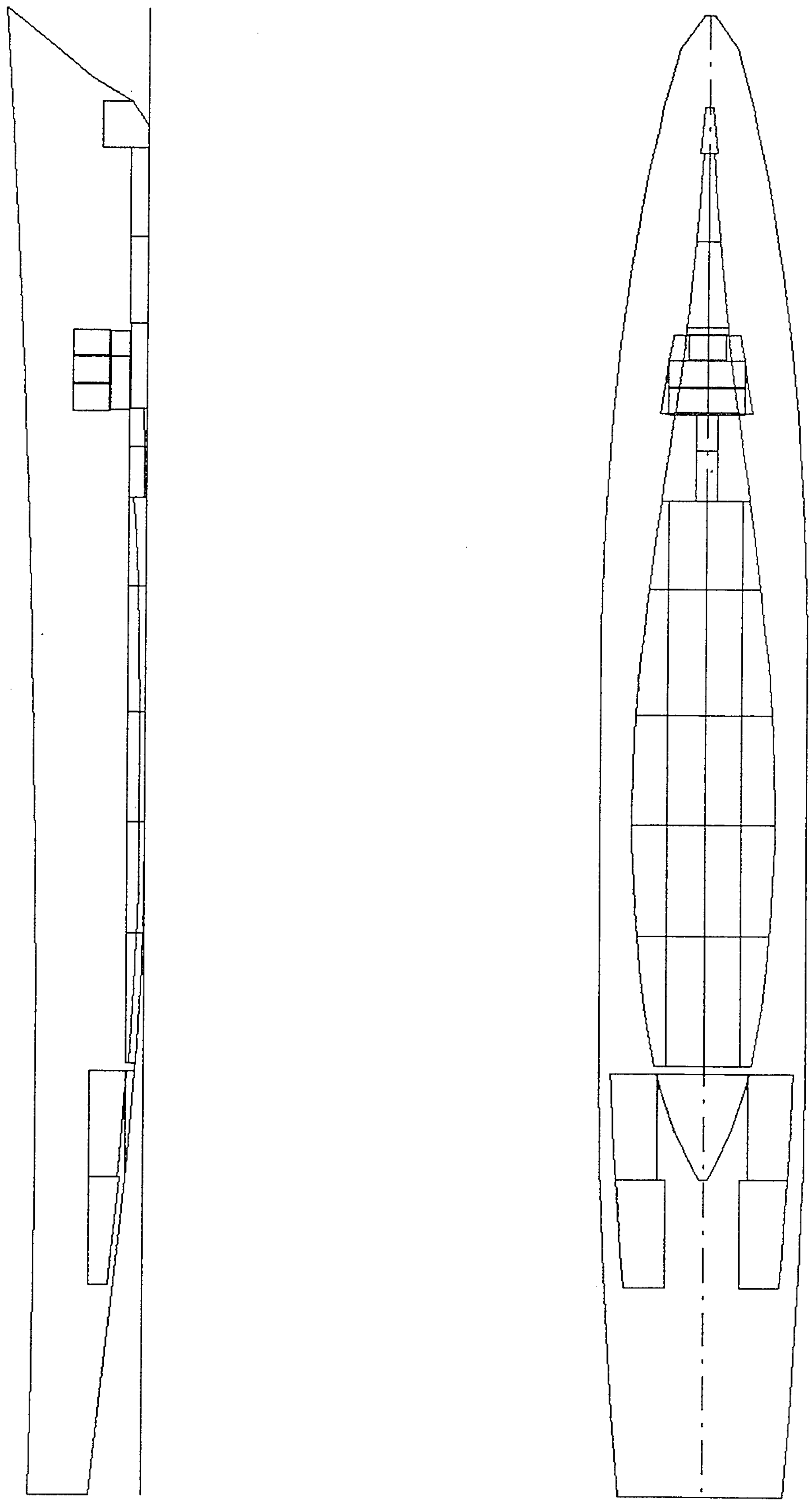
GHS-GHS/PM 2.18

Page 1

CPCX COAST GUARD



Scale = 1:550

Comments

Offsets derived from SHCP data.

| Part Name | Class | Description | Location | Volume |
|---|---|---|---|---|
| HULL | HULL | | 18.36f to 380.00a | |
| TANK1.C | TANK | | 6.50a to 18.80a | 298.500 |
| TANK2.S | TANK | | 18.80a to 42.50a | 172.666 |
| TANK2.P | TANK | | 18.80a to 42.50a | 172.666 |
| TANK3.S | TANK | | 42.50a to 65.50a | 309.295 |
| TANK3.P | TANK | | 42.50a to 65.50a | 309.295 |
| TANK5.S | TANK | | 88.50a to 112.10a | 385.975 |
| TANK5.P | TANK | | 88.50a to 112.10a | 385.975 |
| TANK5.C | TANK | | 98.50a to 112.10a | 373.464 |
| TANK7.S | TANK | | 135.70a to 170.24a | 378.919 |
| TANK7.P | TANK | | 135.70a to 170.24a | 378.919 |
| TANK7I.S | TANK | | 135.70a to 170.24a | 1343.13 |
| TANK7I.P | TANK | | 135.70a to 170.24a | 1343.13 |
| TANK8.S | TANK | | 170.24a to 199.40a | 472.232 |
| TANK8.P | TANK | | 170.24a to 199.40a | 472.232 |
| TANK8I.S | TANK | | 170.24a to 199.40a | 1168.17 |
| TANK8I.P | TANK | | 170.24a to 199.40a | 1168.17 |
| TANK10.S | TANK | | 228.90a to 264.32a | 220.209 |
| TANK10.P | TANK | | 228.90a to 264.32a | 220.209 |
| TANK10I.S | TANK | | 228.90a to 264.32a | 997.696 |
| TANK10I.P | TANK | | 228.90a to 264.32a | 997.696 |
| TANK4.S | TANK | | 65.50a to 88.50a | 440.828 |
| TANK4.P | TANK | | 65.50a to 88.50a | 440.828 |
| TANK6I.S | TANK | | 112.10a to 135.70a | 837.379 |
| TANK6I.P | TANK | | 112.10a to 135.70a | 837.379 |
| TANK6.S | TANK | | 112.10a to 135.70a | 86.364 |
| TANK6.P | TANK | | 112.10a to 135.70a | 86.364 |
| TANK11.C | TANK | | 266.32a to 294.50a | 424.105 |
| TANK12.S | TANK | | 266.32a to 294.50a | 1839.76 |
| TANK12.P | TANK | | 266.32a to 294.50a | 1839.76 |
| TANK13.S | TANK | | 294.50a to 323.30a | 1411.90 |
| TANK9I.S | TANK | | 199.40a to 228.90a | 1143.06 |
| TANK9I.P | TANK | | 199.40a to 228.90a | 1143.06 |
| TANK9.S | TANK | | 199.40a to 228.90a | 432.944 |
| TANK9.P | TANK | | 199.40a to 228.90a | 432.944 |
| TANK13.P | TANK | | 294.50a to 323.30a | 1411.90 |
| TANK14.C | TANK | | 67.50a to 74.60a | 677.808 |
| TANK15.S | TANK | | 74.70a to 81.80a | 678.487 |
| TANK15.P | TANK | | 74.70a to 81.80a | 678.487 |
| TANK16.S | TANK | | 82.00a to 89.10a | 678.487 |
| TANK16.P | TANK | | 82.00a to 89.10a | 678.487 |
| TANK17.C | TANK | | 74.80a to 89.00a | 1302.49 |
| TANK18.C | TANK | | 67.70a to 74.80a | 543.529 |

Locations in Feet fwd/aft of the origin. Volumes in cubic Feet.

# APPENDIX N

## ASSET PRINTED REPORTS

## SUMMARY

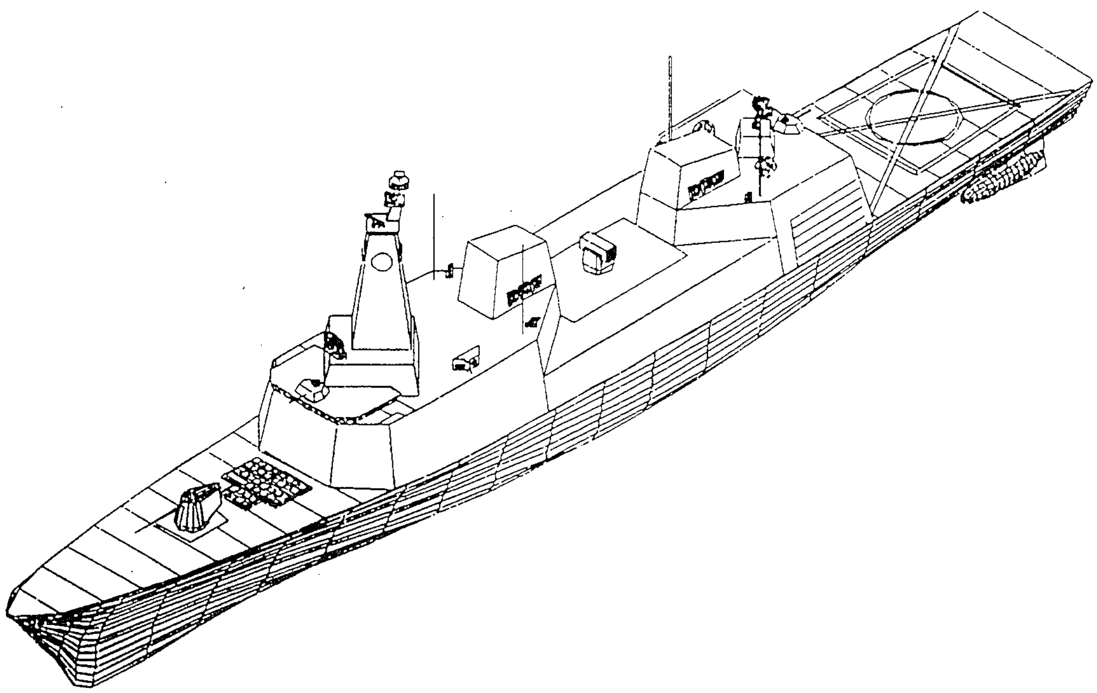
ASSET is a family of interactive computer programs developed by Boeing Computer Services, for use in the exploratory and feasibility design phases of Navy surface ships. A distinct program exists for each of several ship types, including monohull surface combatants, small waterplane area twin hull (SWATH) ships, and hydrofoils. Each program features design synthesis capability, database management, and extensive input/output options including interactive graphics and use of either English or metric units.

CPCX was designed using the monohull surface combatant program.

ASSET works in a logical fashion. It starts with an initialization section, which is followed by the synthesis section (hull (and superstructure) design, resistance, machinery, weight and space). If convergence is not achieved, the synthesis section iterates upon itself until convergence is achieved. Synthesis is followed by the analysis section which includes: performance, hydrostatics, seakeeping, manning and cost.

Two ASSET design reports are contained in this appendix (N). The first is for the selected Navy version, the second is the selected Coast Guard version. While these printed reports describe the ship in fairly high detail, it should be noted that they represent a preliminary design, not a detailed design.

# NAVY VERSION
# ASSET PRINTED REPORT



ADVANCED SURFACE SHIP EVALUATION TOOL (ASSET)
MONOHULL SURFACE COMBATANT PROGRAM (MONOSC)
VERSION 3.3+ DATED OCTOBER 3, 1994

ASSET/MONOSC VERSION 3.3+ - HULL GEOM MODULE - 2/11/95 10.45.20.

PRINTED REPORT NO. 1 - HULL GEOMETRY SUMMARY

| | | | |
|---|---|---|---|
| HULL OFFSETS IND-GENERATE | | MIN BEAM, FT | 36.00 |
| HULL DIM IND-B+T | | MAX BEAM, FT | 51.00 |
| MARGIN LINE IND-CALC | | HULL FLARE ANGLE, DEG | 7.00 |
| HULL STA IND-OPTIMUM | | FORWARD BULWARK, FT | 0.00 |
| HULL BC IND-CONV DD | | | |

HULL PRINCIPAL DIMENSIONS (ON DWL)

| | | | |
|---|---|---|---|
| LBP, FT | 380.00 | PRISMATIC COEF | 0.570 |
| LOA, FT | 398.36 | MAX SECTION COEF | 0.795 |
| BEAM, FT | 51.00 | WATERPLANE COEF | 0.730 |
| BEAM @ WEATHER DECK, FT | 54.56 | LCB/LCP | 0.515 |
| DRAFT, FT | 15.50 | HALF SIDING WIDTH, FT | 1.00 |
| DEPTH STA 0, FT | 37.60 | BOT RAKE, FT | 0.00 |
| DEPTH STA 3, FT | 34.42 | RAISED DECK HT, FT | 0.00 |
| DEPTH STA 10, FT | 30.00 | RAISED DECK FWD LIM, STA | |
| DEPTH STA 20, FT | 30.76 | RAISED DECK AFT LIM, STA | |
| FREEBOARD @ STA 3, FT | 18.92 | BARE HULL DISPL, LTON | 3890.30 |
| STABILITY BEAM, FT | 50.23 | AREA BEAM, FT | 52.51 |

| BARE HULL DATA ON LWL | | STABILITY DATA ON LWL | |
|---|---|---|---|
| LGTH ON WL, FT | 380.00 | KB, FT | 9.54 |
| BEAM, FT | 51.00 | BMT, FT | 16.42 |
| DRAFT, FT | 15.50 | KG, FT | 19.74 |
| FREEBOARD @ STA 3, FT | 18.92 | FREE SURF COR, FT | 0.10 |
| PRISMATIC COEF | 0.570 | SERV LIFE KG ALW, FT | 0.50 |
| MAX SECTION COEF | 0.795 | | |
| WATERPLANE COEF | 0.734 | GMT, FT | 5.62 |
| WATERPLANE AREA, FT2 | 14229.80 | GML, FT | 827.27 |
| WETTED SURFACE, FT2 | 19071.06 | GMT/B AVAIL | 0.110 |
| | | GMT/B REQ | 0.100 |
| BARE HULL DISPL, LTON | 3892.53 | | |
| APPENDAGE DISPL, LTON | 87.58 | | |
| FULL LOAD WT, LTON | 3980.10 | | |

PRINTED REPORT NO. 2 - HULL OFFSETS

STATION NO. 1, AT X = -18.356 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 0.000 | 38.503 |
| 2 | 0.328 | 38.561 |
| 3 | 0.762 | 38.620 |
| 4 | 1.203 | 38.678 |
| 5 | 1.424 | 38.736 |

STATION NO. 2, AT X = -9.178 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 0.000 | 26.708 |
| 2 | 1.196 | 29.566 |
| 3 | 3.299 | 32.424 |
| 4 | 5.765 | 35.282 |
| 5 | 7.922 | 38.140 |

STATION NO. 3, AT X = 0.000 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 0.128 | 15.503 |
| 2 | 1.445 | 21.018 |
| 3 | 3.869 | 26.534 |
| 4 | 6.994 | 32.049 |
| 5 | 10.413 | 37.564 |

STATION NO. 4, AT X = 6.504 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 0.000 | 4.541 |
| 2 | 0.005 | 4.552 |
| 3 | 0.049 | 4.628 |
| 4 | 0.171 | 4.837 |
| 5 | 0.378 | 5.242 |
| 6 | 0.628 | 5.911 |
| 7 | 0.840 | 6.909 |
| 8 | 0.932 | 8.301 |
| 9 | 0.897 | 10.153 |
| 10 | 0.858 | 12.532 |
| 11 | 1.116 | 15.503 |
| 12 | 2.639 | 20.919 |
| 13 | 5.164 | 26.335 |
| 14 | 8.373 | 31.752 |
| 15 | 11.949 | 37.168 |

STATION NO. 5, AT X = 13.009 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 0.000 | 0.000 |
| 2 | 0.018 | 0.016 |
| 3 | 0.099 | 0.124 |
| 4 | 0.243 | 0.419 |
| 5 | 0.443 | 0.992 |
| 6 | 0.670 | 1.938 |
| 7 | 0.878 | 3.349 |
| 8 | 1.038 | 5.318 |
| 9 | 1.181 | 7.938 |
| 10 | 1.448 | 11.302 |
| 11 | 2.123 | 15.503 |
| 12 | 3.821 | 20.823 |
| 13 | 6.430 | 26.142 |
| 14 | 9.704 | 31.461 |
| 15 | 13.397 | 36.781 |

STATION NO. 6, AT X = 32.133 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 0.753 | 0.000 |
| 2 | 0.779 | 0.016 |
| 3 | 0.889 | 0.124 |
| 4 | 1.072 | 0.419 |
| 5 | 1.328 | 0.992 |
| 6 | 1.654 | 1.938 |
| 7 | 2.052 | 3.349 |
| 8 | 2.534 | 5.318 |
| 9 | 3.146 | 7.938 |
| 10 | 3.987 | 11.302 |
| 11 | 5.226 | 15.503 |
| 12 | 7.269 | 20.552 |
| 13 | 10.023 | 25.602 |
| 14 | 13.364 | 30.651 |
| 15 | 17.163 | 35.700 |

STATION NO. 7, AT X = 51.257 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 0.000 |
| 2 | 1.039 | 0.016 |
| 3 | 1.213 | 0.124 |
| 4 | 1.531 | 0.419 |
| 5 | 2.007 | 0.992 |
| 6 | 2.652 | 1.938 |
| 7 | 3.463 | 3.349 |
| 8 | 4.434 | 5.318 |
| 9 | 5.570 | 7.938 |
| 10 | 6.907 | 11.302 |
| 11 | 8.517 | 15.503 |
| 12 | 10.681 | 20.303 |
| 13 | 13.425 | 25.103 |
| 14 | 16.647 | 29.904 |
| 15 | 20.243 | 34.704 |

STATION NO. 8, AT X = 70.381 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 0.000 |
| 2 | 1.059 | 0.016 |
| 3 | 1.336 | 0.124 |
| 4 | 1.870 | 0.419 |
| 5 | 2.697 | 0.992 |
| 6 | 3.819 | 1.938 |
| 7 | 5.189 | 3.349 |
| 8 | 6.732 | 5.318 |
| 9 | 8.376 | 7.938 |
| 10 | 10.085 | 11.302 |
| 11 | 11.871 | 15.503 |
| 12 | 13.971 | 20.075 |
| 13 | 16.563 | 24.647 |
| 14 | 19.514 | 29.219 |
| 15 | 22.692 | 33.792 |

STATION NO. 9, AT X = 89.505 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 0.000 |
| 2 | 1.089 | 0.016 |
| 3 | 1.511 | 0.124 |
| 4 | 2.328 | 0.419 |
| 5 | 3.583 | 0.992 |
| 6 | 5.254 | 1.938 |
| 7 | 7.226 | 3.349 |
| 8 | 9.326 | 5.318 |
| 9 | 11.391 | 7.938 |
| 10 | 13.324 | 11.302 |
| 11 | 15.116 | 15.503 |
| 12 | 17.016 | 19.868 |
| 13 | 19.338 | 24.233 |
| 14 | 21.912 | 28.599 |
| 15 | 24.567 | 32.964 |

STATION NO. 10, AT X = 108.629 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 0.000 |
| 2 | 1.135 | 0.016 |
| 3 | 1.757 | 0.124 |
| 4 | 2.923 | 0.419 |
| 5 | 4.665 | 0.992 |
| 6 | 6.918 | 1.938 |
| 7 | 9.479 | 3.349 |
| 8 | 12.066 | 5.318 |
| 9 | 14.427 | 7.938 |
| 10 | 16.424 | 11.302 |
| 11 | 18.079 | 15.503 |
| 12 | 19.698 | 19.682 |
| 13 | 21.674 | 23.862 |
| 14 | 23.814 | 28.041 |
| 15 | 25.923 | 32.220 |

STATION NO. 11, AT X = 127.753 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 0.000 |
| 2 | 1.198 | 0.016 |
| 3 | 2.074 | 0.124 |
| 4 | 3.637 | 0.419 |
| 5 | 5.885 | 0.992 |
| 6 | 8.694 | 1.938 |
| 7 | 11.772 | 3.349 |
| 8 | 14.737 | 5.318 |
| 9 | 17.259 | 7.938 |
| 10 | 19.190 | 11.302 |
| 11 | 20.621 | 15.503 |
| 12 | 21.929 | 19.518 |
| 13 | 23.526 | 23.532 |
| 14 | 25.219 | 27.547 |
| 15 | 26.816 | 31.561 |

STATION NO. 12, AT X = 146.878 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 0.000 |
| 2 | 1.264 | 0.016 |
| 3 | 2.397 | 0.124 |
| 4 | 4.346 | 0.419 |
| 5 | 7.060 | 0.992 |
| 6 | 10.356 | 1.938 |
| 7 | 13.859 | 3.349 |
| 8 | 17.098 | 5.318 |
| 9 | 19.685 | 7.938 |
| 10 | 21.477 | 11.302 |
| 11 | 22.653 | 15.503 |
| 12 | 23.661 | 19.374 |
| 13 | 24.883 | 23.245 |
| 14 | 26.153 | 27.116 |
| 15 | 27.303 | 30.987 |

STATION NO. 13, AT X = 166.002 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 0.000 |
| 2 | 1.304 | 0.016 |
| 3 | 2.604 | 0.124 |
| 4 | 4.828 | 0.419 |
| 5 | 7.903 | 0.992 |
| 6 | 11.598 | 1.938 |
| 7 | 15.457 | 3.349 |
| 8 | 18.922 | 5.318 |
| 9 | 21.546 | 7.938 |
| 10 | 23.193 | 11.302 |
| 11 | 24.141 | 15.503 |
| 12 | 24.888 | 19.251 |
| 13 | 25.764 | 23.000 |
| 14 | 26.653 | 26.748 |
| 15 | 27.440 | 30.496 |

STATION NO. 14, AT X = 185.126 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 0.000 |
| 2 | 1.310 | 0.016 |
| 3 | 2.654 | 0.124 |
| 4 | 4.990 | 0.419 |
| 5 | 8.257 | 0.992 |
| 6 | 12.202 | 1.938 |
| 7 | 16.317 | 3.349 |
| 8 | 19.974 | 5.318 |
| 9 | 22.674 | 7.938 |
| 10 | 24.272 | 11.302 |
| 11 | 25.097 | 15.503 |
| 12 | 25.667 | 19.150 |
| 13 | 26.285 | 22.797 |
| 14 | 26.895 | 26.443 |
| 15 | 27.440 | 30.090 |

STATION NO. 15, AT X = 204.250 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 0.000 |
| 2 | 1.309 | 0.016 |
| 3 | 2.645 | 0.124 |
| 4 | 4.961 | 0.419 |
| 5 | 8.200 | 0.992 |
| 6 | 12.130 | 1.938 |
| 7 | 16.270 | 3.349 |
| 8 | 20.019 | 5.318 |
| 9 | 22.879 | 7.938 |
| 10 | 24.656 | 11.302 |
| 11 | 25.569 | 15.503 |
| 12 | 26.064 | 19.069 |
| 13 | 26.539 | 22.636 |
| 14 | 26.996 | 26.202 |
| 15 | 27.440 | 29.768 |

STATION NO. 16, AT X = 226.219 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 0.258 |
| 2 | 1.259 | 0.273 |
| 3 | 2.417 | 0.380 |
| 4 | 4.514 | 0.670 |
| 5 | 7.554 | 1.234 |
| 6 | 11.352 | 2.164 |
| 7 | 15.473 | 3.551 |
| 8 | 19.340 | 5.487 |
| 9 | 22.442 | 8.063 |
| 10 | 24.509 | 11.372 |
| 11 | 25.604 | 15.503 |
| 12 | 26.115 | 19.003 |
| 13 | 26.574 | 22.503 |
| 14 | 27.007 | 26.003 |
| 15 | 27.440 | 29.503 |

STATION NO. 17, AT X = 248.188 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 1.084 |
| 2 | 1.160 | 1.099 |
| 3 | 1.990 | 1.200 |
| 4 | 3.746 | 1.474 |
| 5 | 6.556 | 2.007 |
| 6 | 10.280 | 2.887 |
| 7 | 14.467 | 4.199 |
| 8 | 18.488 | 6.030 |
| 9 | 21.769 | 8.467 |
| 10 | 23.994 | 11.596 |
| 11 | 25.196 | 15.503 |
| 12 | 25.815 | 18.964 |
| 13 | 26.403 | 22.426 |
| 14 | 26.949 | 25.887 |
| 15 | 27.440 | 29.348 |

STATION NO. 18, AT X = 270.156 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 2.507 |
| 2 | 1.101 | 2.520 |
| 3 | 1.721 | 2.611 |
| 4 | 3.218 | 2.858 |
| 5 | 5.784 | 3.339 |
| 6 | 9.317 | 4.132 |
| 7 | 13.395 | 5.314 |
| 8 | 17.402 | 6.965 |
| 9 | 20.758 | 9.161 |
| 10 | 23.111 | 11.981 |
| 11 | 24.423 | 15.503 |
| 12 | 25.221 | 18.954 |
| 13 | 26.042 | 22.404 |
| 14 | 26.798 | 25.855 |
| 15 | 27.400 | 29.306 |

STATION NO. 19, AT X = 292.125 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 4.469 |
| 2 | 1.069 | 4.480 |
| 3 | 1.558 | 4.558 |
| 4 | 2.850 | 4.767 |
| 5 | 5.159 | 5.176 |
| 6 | 8.421 | 5.849 |
| 7 | 12.268 | 6.853 |
| 8 | 16.140 | 8.254 |
| 9 | 19.486 | 10.119 |
| 10 | 21.925 | 12.513 |
| 11 | 23.318 | 15.503 |
| 12 | 24.307 | 18.971 |
| 13 | 25.340 | 22.438 |
| 14 | 26.280 | 25.906 |
| 15 | 26.988 | 29.374 |

STATION NO. 20, AT X = 314.094 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 6.831 |
| 2 | 1.050 | 6.840 |
| 3 | 1.445 | 6.900 |
| 4 | 2.555 | 7.065 |
| 5 | 4.594 | 7.386 |
| 6 | 7.531 | 7.915 |
| 7 | 11.067 | 8.704 |
| 8 | 14.722 | 9.806 |
| 9 | 17.988 | 11.271 |
| 10 | 20.460 | 13.153 |
| 11 | 21.874 | 15.503 |
| 12 | 23.062 | 19.016 |
| 13 | 24.281 | 22.528 |
| 14 | 25.373 | 26.041 |
| 15 | 26.179 | 29.553 |

STATION NO. 21, AT X = 336.063 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 9.396 |
| 2 | 1.037 | 9.402 |
| 3 | 1.358 | 9.444 |
| 4 | 2.292 | 9.560 |
| 5 | 4.043 | 9.786 |
| 6 | 6.612 | 10.159 |
| 7 | 9.778 | 10.715 |
| 8 | 13.148 | 11.490 |
| 9 | 16.269 | 12.523 |
| 10 | 18.708 | 13.848 |
| 11 | 20.069 | 15.503 |
| 12 | 21.475 | 19.088 |
| 13 | 22.880 | 22.674 |
| 14 | 24.121 | 26.259 |
| 15 | 25.033 | 29.844 |

STATION NO. 22, AT X = 358.031 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 11.952 |
| 2 | 1.028 | 11.956 |
| 3 | 1.284 | 11.981 |
| 4 | 2.046 | 12.048 |
| 5 | 3.496 | 12.180 |
| 6 | 5.667 | 12.396 |
| 7 | 8.415 | 12.719 |
| 8 | 11.444 | 13.170 |
| 9 | 14.359 | 13.770 |
| 10 | 16.700 | 14.541 |
| 11 | 17.931 | 15.503 |
| 12 | 19.580 | 19.189 |
| 13 | 21.183 | 22.875 |
| 14 | 22.580 | 26.561 |
| 15 | 23.610 | 30.247 |

STATION NO. 23, AT X = 380.000 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 14.315 |
| 2 | 1.024 | 14.317 |
| 3 | 1.231 | 14.325 |
| 4 | 1.833 | 14.347 |
| 5 | 2.987 | 14.391 |
| 6 | 4.752 | 14.464 |
| 7 | 7.066 | 14.572 |
| 8 | 9.727 | 14.723 |
| 9 | 12.401 | 14.924 |
| 10 | 14.601 | 15.181 |
| 11 | 15.646 | 15.503 |
| 12 | 17.541 | 19.317 |
| 13 | 19.309 | 23.132 |
| 14 | 20.827 | 26.946 |
| 15 | 21.968 | 30.760 |

PRINTED REPORT NO. 3 - HULL BOUNDARY CONDITIONS

HULL OFFSETS IND-GENERATE
HULL BC IND-CONV DD

HULL STA IND-OPTIMUM

| | | | |
|---|---|---|---|
| LBP, FT | 380.00 | LCB/LBP | 0.515 |
| BEAM, FT | 51.00 | LCF/LBP | 0.571 |
| DRAFT, FT | 15.50 | HALF SIDING WIDTH, FT | 1.00 |
| DEPTH STA 0, FT | 37.60 | BOT RAKE, FT | 0.00 |
| DEPTH STA 3, FT | 34.42 | FWD RAISED DECK LIMIT | |
| DEPTH STA 10, FT | 30.00 | AFT RAISED DECK LIMIT | |
| DEPTH STA 20, FT | 30.76 | RAISED DECK HT, FT | 0.00 |
| PRISMATIC COEF | 0.570 | WATERPLANE COEF | 0.730 |
| MAX SECTION COEF | 0.795 | | |
| NO POINTS BELOW DWL | 11. | FWD KEEL/BL LIMIT | 0.034 |
| NO POINTS ABOVE DWL | 4. | AFT KEEL/BL LIMIT | 0.538 |
| POINT DIST FAC ABOVE DWL | 3.000 | BOW ANGLE, DEG | 50.00 |
| POINT DIST FAC BELOW DWL | 1.000 | BOW SHAPE FAC | 0.000 |
| BOW OVERHANG | 0.049 | STA 20 SECTION COEF | 0.700 |
| STERN OVERHANG | 0.009 | HULL FLARE ANGLE, DEG | |

SECTIONAL AREA AND DWL CURVES

| | AREA | DWL |
|---|---|---|
| STA 0 ORDINATE | 0.000 | 0.005 |
| STA 0 SLOPE | -0.833 | -1.117 |
| STA 20 ORDINATE | 0.041 | 0.610 |
| STA 20 SLOPE | 0.722 | 0.751 |
| PARALLEL MID LGTH | 0.000 | 0.000 |
| STA MAX ORDINATE | 10.500 | 11.400 |
| STA MAX AREA SLOPE | 0.000 | 0.000 |
| TENSOR NO 1 | 0.000 | 0.000 |
| TENSOR NO 2 | 0.000 | 0.000 |
| TENSOR NO 3 | 0.000 | 0.000 |
| TENSOR NO 4 | 0.000 | 0.000 |
| TENSOR/POLY SWITCH | -1.000 | -1.000 |

| DECK AT EDGE CURVE | |
|---|---|
| STATION 0 OFFSET | 0.406 |
| STA 0 SLOPE | -1.800 |
| STA 10 OFFSET | 1.070 |
| STA 10 SLOPE | 0.000 |
| STATION 20 OFFSET | 0.856 |
| STA 20 SLOPE | 0.584 |
| PARALLEL MID LGTH | 0.254 |
| STA OF PARALLEL MID | 11.205 |

| FLAT OF BOTTOM CURVE | |
|---|---|
| STA OF TRANS START | 10.000 |
| SLOPE-STA OF TRANS START | 0.000 |
| STA OF START OF MID | 10.000 |
| STA OF END OF MID | 10.000 |
| STA OF TRANS END | 10.000 |
| SLOPE-STA OF TRANS END | 0.000 |
| FLAT OF BOT ANGLE, DEG | 0.050 |
| ELLIPSE RATIO | 1.000 |

SLOPES AT SECTION CURVES

| | BOT | DWL | DAE |
|---|---|---|---|
| STA 0 ORDINATE, DEG | 44.437 | 83.500 | 58.107 |
| STA 0 SLOPE | 126.543 | 96.943 | 68.339 |
| STA 10 ORDINATE, DEG | 2.351 | 82.000 | 83.000 |
| STA 10 SLOPE | -0.500 | 0.000 | 0.000 |
| STA 20 ORDINATE, DEG | 3.000 | 63.333 | 76.556 |
| STA 20 SLOPE | 60.000 | 25.000 | 11.667 |
| PARALLEL MID LGTH | 0.060 | 0.000 | 0.000 |
| STA OF PARALLEL MID | 10.500 | 10.252 | 10.500 |

PRINTED REPORT NO. 4 - MARGIN LINE

MARGIN LINE IND-CALC
MIN FREEBOARD MARGIN, FT 0.25

| DIST FROM FP FT | HT ABOVE BL FT |
|---|---|
| -18.36 | 38.49 |
| -9.18 | 37.89 |
| 0.00 | 37.31 |
| 6.50 | 36.92 |
| 13.01 | 36.53 |
| 32.13 | 35.45 |
| 51.26 | 34.45 |
| 70.38 | 33.54 |
| 89.51 | 32.71 |
| 108.63 | 31.97 |
| 127.75 | 31.31 |
| 146.88 | 30.74 |
| 166.00 | 30.25 |
| 185.13 | 29.84 |
| 204.25 | 29.52 |
| 226.22 | 29.25 |
| 248.19 | 29.10 |
| 270.16 | 29.06 |
| 292.13 | 29.12 |
| 314.09 | 29.30 |
| 336.06 | 29.59 |
| 358.03 | 30.00 |
| 380.00 | 30.51 |

PRINTED REPORT NO. 5 - HULL SECTIONAL AREA CURVE

| STATION | LOCATION, FT | AREA, FT2 |
|---|---|---|
| 1 | -18.36 | 0.00 |
| 2 | -9.18 | 0.00 |
| 3 | 0.00 | 0.00 |
| 4 | 6.50 | 18.18 |
| 5 | 13.01 | 36.89 |
| 6 | 32.13 | 96.67 |
| 7 | 51.26 | 164.94 |
| 8 | 70.38 | 240.98 |
| 9 | 89.51 | 321.80 |
| 10 | 108.63 | 402.87 |
| 11 | 127.75 | 478.80 |
| 12 | 146.88 | 543.96 |
| 13 | 166.00 | 593.18 |
| 14 | 185.13 | 622.22 |
| 15 | 204.25 | 628.21 |
| 16 | 226.22 | 605.33 |
| 17 | 248.19 | 552.18 |
| 18 | 270.16 | 473.62 |
| 19 | 292.13 | 377.59 |
| 20 | 314.09 | 274.32 |
| 21 | 336.06 | 175.00 |
| 22 | 358.03 | 89.92 |
| 23 | 380.00 | 26.03 |

```
ASSET/MONOSC VERSION 3.3+ - HULL SUBDIV MODULE - 2/11/95  10.45.50.

 PRINTED REPORT NO. 1 - SUMMARY

 HULL SUBDIV IND-CALC                          INNER BOT IND-PRESENT
 SHAFT SUPPORT TYPE IND-POD

 LBP, FT                      380.00       HULL AVG DECK HT, FT       10.57
 DEPTH STA 10, FT              30.00
                                           NO INTERNAL DECKS              2
 HULL VOLUME, FT3            388003.       NO TRANS BHDS                 13
 MR VOLUME, FT3               49678.       NO LONG BHDS                   0
 TANKAGE VOL REQ, FT3         22382.       NO MACHY RMS                   2
 EXCESS TANKAGE, FT3           7813.       NO PROP SHAFTS                 2

 ARR AREA LOST TANKS, FT2      32.2
 HULL ARR AREA AVAIL, FT2   29486.0

 PRINTED REPORT NO. 2 - TRANSVERSE BULKHEADS

 HULL SUBDIV IND-CALC
 NO TRANS BHDS                    13
 TRANS BHD SPACING(/LBP)       0.077

 BULKHEAD    DISTANCE    DISTANCE     MR FWD
    NO      FROM FP,FT  FROM FP/LBP   BHD LOC
 ========   ==========  ===========   =======
     1         19.00       0.050
     2         42.49       0.112
     3         65.98       0.174
     4         89.47       0.235
     5        112.96       0.297
     6        136.45       0.359        MMR
     7        171.97       0.453
     8        201.23       0.530
     9        230.49       0.607        MMR
    10        266.00       0.700
    11        294.50       0.775
    12        323.00       0.850
    13        351.50       0.925

 PRINTED REPORT NO. 3 - LONGITUDINAL BULKHEADS

 NO LONG BHDS                      0

 PRINTED REPORT NO. 4 - INTERNAL DECKS AND INNER BOTTOM

 HULL SUBDIV IND-CALC                          INNER BOT IND-PRESENT

 NO INTERNAL DECKS                 2       --------- INNER BOTTOM ----------
 DEPTH STA 10, FT              30.00       CVK HT, FT                     4.50
 HULL AVG DECK HT, FT          10.57       HORZ OFFSET HT, FT
 RAISED DECK HT, FT             0.00       HORZ OFFSET, FT
                                           FLAT FWD LOC, FT              19.00
 INT   DIST FROM   DECK                    FLAT AFT LOC, FT             292.42
 DECK    BL AT     SHEER                   OFFSET FWD LOC, FT
  NO   .5 LBP,FT   FRAC                    OFFSET AFT LOC, FT
 ====  =========   =====
  1      20.00      1.0
  2      12.25      0.0
  IB      4.50

 INT    AVL ARR    AVL ARR    USABLE     VOIDS     ARR AREA
 DECK    AREA        VOL      TANKAGE              LOST TO
  NO     FT2         FT3       FT3        FT3      TANKS,FT2
 ====   =======    =======    =======    =====     =========
  1     15905.2    174346.        0.        0.           0.0
  2      9355.7     92327.      606.      309.           0.0
  IB     4225.1     45118.      245.        0.          32.2
 HOLD                         29344.       56.
        -------    -------    -------    -----     ---------
 TOTAL  29486.0    311791.    30195.      366.          32.2
```

PRINTED REPORT NO. 5 - LARGE OBJECT SPACES

SHAFT SUPPORT TYPE IND-POD

| | |
|---|---|
| FOREPEAK VOID VOL, FT3 | 366. |
| FOREPEAK TANKAGE, FT3 | 731. |
| CHAIN LOCKER VOL, FT3 | 1097. |
| SEWAGE VOL REQ, FT3 | 245. |
| SHAFT ALLEY VOL, FT3 | 0. |
| ADDED STEER GEAR VOL, FT3 | 4895. |
| MR AFT BHD POS, FT | 266.00 |
| INNER BOT VOL, FT3 | 17508. |

| MR NO | TYPE | FWD BHD ID | UPR DECK ID | LGTH AVL FT | LGTH RQD FT | HT AVL FT | HT RQD FT | MR VOL FT3 | INNER BOT VOL FT3 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | MMR | 6 | 1 | 35.51 | 35.51 | 20.00 | 19.63 | 25422. | 3505. |
| 2 | MMR | 9 | 1 | 35.51 | 35.51 | 20.00 | 19.63 | 24255. | 2233. |
| | | | | | | | TOTAL | 49678. | 5738. |

PRINTED REPORT NO. 6 - HULL COMPARTMENT ARRANGEABLE AREA

NUMBER OF INTERNAL DECKS - 2
NUMBER OF TRANSVERSE BULKHEADS - 13
INNER BOTTOM INDICATOR - PRESENT

AREAS FOR EACH HULL COMPARTMENT:

| DECK HT, FT ABL | 20.0 | 12.3 | 4.5 |
|---|---|---|---|
| COMP 1, FT2 | 284.0 | | |
| COMP 2, FT2 | 462.3 | 190.9 | 105.6 |
| COMP 3, FT2 | 640.1 | 365.9 | 205.3 |
| COMP 4, FT2 | 800.9 | 553.2 | 330.0 |
| COMP 5, FT2 | 940.1 | 737.6 | 473.7 |
| COMP 6, FT2 | 1052.9 | 900.6 | 620.5 |
| COMP 7, FT2 | 1741.9 | MMR | MMR |
| COMP 8, FT2 | 1511.4 | 1437.5 | 1086.4 |
| COMP 9, FT2 | 1532.5 | 1460.3 | 1060.0 |
| COMP 10, FT2 | 1836.3 | MMR | MMR |
| COMP 11, FT2 | 1420.2 | 1287.4 | 375.9 |
| COMP 12, FT2 | 1341.7 | 1140.7 | |
| COMP 13, FT2 | 1234.6 | 845.7 | |
| COMP 14, FT2 | 1106.3 | 435.7 | |

ASSET/MONOSC VERSION 3.3+ - DECKHOUSE MODULE - 2/11/95 10.46.02.

** WARNING - DECKHOUSE MODULE ** (W-DKHSAUTOXLIMIT-DKSCOM)
DECKHOUSE DIMENSIONS HAVE REACHED MAXIMUM ALLOWABLE LIMITS FOR "AUTO X" DECKHOUSE SIZING MODE. FOR A TOTAL SHIP AREA BALANCE, THE ADDITIONAL AMOUNT OF DECKHOUSE ARRANGEABLE AREA REQUIRED IS 1222.5 FT2.

PRINTED REPORT NO. 1 - DECKHOUSE SUMMARY

| | | | |
|---|---|---|---|
| DKHS GEOM IND-GENERATE | | BLAST RESIST IND-7 PSI | |
| DKHS SIZE IND-AUTO X | | FIRE PROTECT IND-NONE | |
| DKHS MTRL TYPE IND-HTS | | | |
| LBP, FT | 380.00 | DKHS LENGTH OA, FT | 200.37 |
| BEAM, FT | 51.00 | DKHS MAX WIDTH, FT | 54.93 |
| AREA BEAM, FT | 52.51 | DKHS HT (W/O PLTHS), FT | 42.50 |
| DKHS FWD LIMIT- | STA 4.0 | OTHER ARR AREA REQ, FT2 | 36769.60 |
| DKHS AFT LIMIT- | STA 14.5 | HULL ARR AREA AVAIL, FT2 | 29486.04 |
| DKHS AVG DECK HT, FT | 9.84 | DKHS ARR AREA REQ, FT2 | 4850.58 |
| DKHS NO LVLS | 2 | HANGER ARR AREA REQ, FT2 | 0.00 |
| DKHS AVG SIDE CLR, FT | .00 | PLTHS ARR AREA REQ, FT2 | 608.00 |
| DKHS AVG SIDE ANG, DEG | 10.00 | | |
| DKHS NO PRISMS | 20 | DKHS MAX ARR AREA, FT2 | 10911.68 |
| DKHS ARR AREA DERIV, FT2 | 232.60 | DKHS ARR AREA AVAIL, FT2 | 10911.68 |
| DKHS MIN ALW BEAM, FT | 20.73 | DKHS VOLUME, FT3 | 110685.53 |
| BRIDGE L-O-S OVER BOW, FT | 250.09 | | |
| | | DKHS WEIGHT, LTON | 212.74 |
| DKHS SIDE CLR OFFSET, FT | | DKHS VCG, FT | 36.29 |
| DKHS SIDE ANG OFFSET, DEG | | | |
| DKHS DECK HT OFFSET, FT | | | |

PRINTED REPORT NO. 2 - SUPERSTRUCTURE DECKHOUSES

| | |
|---|---|
| NO OF SS DECKHOUSE BLKS | 20 |
| DKHS VOLUME, FT3 | 110686. |
| DKHS ARR AREA AVAIL, FT2 | 10911.7 |

| DECKHOUSE NUMBER | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DIST FROM BOW, FT | 76.00 | 86.55 | 97.09 | 107.64 | 118.18 |
| LENGTH, FT | 10.55 | 10.55 | 10.55 | 10.55 | 10.55 |
| DIST FROM CL, FT | | | | | |
| FWD/PORT/BTM | -23.30 | -24.31 | -25.16 | -25.86 | -26.43 |
| AFT/PORT/BTM | -24.31 | -25.16 | -25.86 | -26.43 | -26.85 |
| FWD/STBD/BTM | 23.30 | 24.31 | 25.16 | 25.86 | 26.43 |
| AFT/STBD/BTM | 24.31 | 25.16 | 25.86 | 26.43 | 26.85 |
| FWD/PORT/TOP | -21.57 | -22.58 | -23.42 | -24.13 | -24.69 |
| AFT/PORT/TOP | -22.58 | -23.42 | -24.13 | -24.69 | -25.11 |
| FWD/STBD/TOP | 21.57 | 22.58 | 23.42 | 24.13 | 24.69 |
| AFT/STBD/TOP | 22.58 | 23.42 | 24.13 | 24.69 | 25.11 |
| DIST ABV BASELINE FWD, FT | 33.54 | 33.09 | 32.66 | 32.26 | 31.88 |
| DIST ABV BASELINE AFT, FT | 33.09 | 32.66 | 32.26 | 31.88 | 31.53 |
| HEIGHT, FT | 9.84 | 9.84 | 9.84 | 9.84 | 9.84 |
| VOLUME, FT3 | 4873. | 5064. | 5221. | 5348. | 5445. |
| ARR AREA, FT2 | 474.4 | 493.6 | 509.6 | 522.7 | 532.9 |

| DECKHOUSE NUMBER | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|
| DIST FROM BOW, FT | 128.73 | 139.28 | 149.82 | 160.37 | 170.91 |
| LENGTH, FT | 10.55 | 10.55 | 10.55 | 10.55 | 10.55 |
| DIST FROM CL, FT | | | | | |
| FWD/PORT/BTM | -26.85 | -27.15 | -27.35 | -27.44 | -27.44 |
| AFT/PORT/BTM | -27.15 | -27.35 | -27.44 | -27.44 | -27.44 |
| FWD/STBD/BTM | 26.85 | 27.15 | 27.35 | 27.44 | 27.44 |
| AFT/STBD/BTM | 27.15 | 27.35 | 27.44 | 27.44 | 27.44 |
| FWD/PORT/TOP | -25.11 | -25.42 | -25.61 | -25.70 | -25.70 |
| AFT/PORT/TOP | -25.42 | -25.61 | -25.70 | -25.70 | -25.70 |
| FWD/STBD/TOP | 25.11 | 25.42 | 25.61 | 25.70 | 25.70 |
| AFT/STBD/TOP | 25.42 | 25.61 | 25.70 | 25.70 | 25.70 |
| DIST ABV BASELINE FWD, FT | 31.53 | 31.20 | 30.91 | 30.63 | 30.38 |
| DIST ABV BASELINE AFT, FT | 31.20 | 30.91 | 30.63 | 30.38 | 30.16 |
| HEIGHT, FT | 9.84 | 9.84 | 9.84 | 9.84 | 9.84 |
| VOLUME, FT3 | 5515. | 5560. | 5583. | 5585. | 5579. |
| ARR AREA, FT2 | 540.4 | 545.5 | 548.5 | 549.4 | 549.5 |

| DECKHOUSE NUMBER | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|
| DIST FROM BOW, FT | 181.46 | 192.01 | 202.55 | 213.10 | 223.64 |
| LENGTH, FT | 10.55 | 10.55 | 10.55 | 10.55 | 10.55 |
| DIST FROM CL, FT | | | | | |
| FWD/PORT/BTM | -27.44 | -27.44 | -27.44 | -27.44 | -27.44 |
| AFT/PORT/BTM | -27.44 | -27.44 | -27.44 | -27.44 | -27.44 |
| FWD/STBD/BTM | 27.44 | 27.44 | 27.44 | 27.44 | 27.44 |
| AFT/STBD/BTM | 27.44 | 27.44 | 27.44 | 27.44 | 27.44 |
| FWD/PORT/TOP | -25.70 | -25.70 | -25.70 | -25.70 | -25.70 |
| AFT/PORT/TOP | -25.70 | -25.70 | -25.70 | -25.70 | -25.70 |
| FWD/STBD/TOP | 25.70 | 25.70 | 25.70 | 25.70 | 25.70 |
| AFT/STBD/TOP | 25.70 | 25.70 | 25.70 | 25.70 | 25.70 |
| DIST ABV BASELINE FWD, FT | 30.16 | 29.96 | 29.79 | 29.65 | 29.53 |
| DIST ABV BASELINE AFT, FT | 29.96 | 29.79 | 29.65 | 29.53 | 29.43 |
| HEIGHT, FT | 9.84 | 9.84 | 9.84 | 9.84 | 9.84 |
| VOLUME, FT3 | 5571. | 5564. | 5557. | 5550. | 5543. |
| ARR AREA, FT2 | 549.5 | 549.5 | 549.5 | 549.5 | 549.5 |

| DECKHOUSE NUMBER | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|
| DIST FROM BOW, FT | 234.19 | 244.74 | 255.28 | 265.83 | 76.00 |
| LENGTH, FT | 10.55 | 10.55 | 10.55 | 10.55 | 22.64 |
| DIST FROM CL, FT | | | | | |
| FWD/PORT/BTM | -27.44 | -27.44 | -27.47 | -27.44 | -15.57 |
| AFT/PORT/BTM | -27.44 | -27.47 | -27.44 | -27.32 | -17.74 |
| FWD/STBD/BTM | 27.44 | 27.44 | 27.47 | 27.44 | 15.57 |
| AFT/STBD/BTM | 27.44 | 27.47 | 27.44 | 27.32 | 17.74 |
| FWD/PORT/TOP | -25.70 | -25.70 | -25.73 | -25.70 | -13.83 |
| AFT/PORT/TOP | -25.70 | -25.73 | -25.70 | -25.59 | -16.00 |
| FWD/STBD/TOP | 25.70 | 25.70 | 25.73 | 25.70 | 13.83 |
| AFT/STBD/TOP | 25.70 | 25.73 | 25.70 | 25.59 | 16.00 |
| DIST ABV BASELINE FWD, FT | 29.43 | 29.37 | 29.32 | 29.31 | 42.50 |
| DIST ABV BASELINE AFT, FT | 29.37 | 29.32 | 29.31 | 29.31 | 42.50 |
| HEIGHT, FT | 9.84 | 9.84 | 9.84 | 9.84 | 9.84 |
| VOLUME, FT3 | 5536. | 5531. | 5524. | 5501. | 7035. |
| ARR AREA, FT2 | 549.5 | 549.8 | 549.7 | 548.2 | 700.8 |

PRINTED REPORT NO. 3 - DECKHOUSE STRUCTURE WEIGHT SUMMARY

DKHS MTRL TYPE IND-HTS
FIRE PROTECT IND-NONE
BLAST RESIST IND-7 PSI

DKHS STRUCT DENSITY, LBM/FT3 4.18
HANGER VOL, FT3 0.

| | WT-LTON | VCG-FT | LCG-FT |
|---|---|---|---|
| CALCULATED SWBS150 | 212.7 | 36.29 | 171.84 |

| DECK HOUSE | VOLUME FT3 | VCG FROM BL FT |
|---|---|---|
| NO. 1 | 4873. | 38.28 |
| NO. 2 | 5064. | 37.84 |
| NO. 3 | 5221. | 37.42 |
| NO. 4 | 5348. | 37.03 |
| NO. 5 | 5445. | 36.66 |
| NO. 6 | 5515. | 36.31 |
| NO. 7 | 5560. | 36.00 |
| NO. 8 | 5583. | 35.70 |
| NO. 9 | 5585. | 35.44 |
| NO.10 | 5579. | 35.20 |
| NO.11 | 5571. | 34.98 |
| NO.12 | 5564. | 34.79 |
| NO.13 | 5557. | 34.62 |
| NO.14 | 5550. | 34.49 |
| NO.15 | 5543. | 34.37 |
| NO.16 | 5536. | 34.28 |
| NO.17 | 5531. | 34.22 |
| NO.18 | 5524. | 34.19 |
| NO.19 | 5501. | 34.17 |
| NO.20 | 7035. | 47.33 |
| | 110686. | 36.29 |

ASSET/MONOSC VERSION 3.3+ - HULL STRUCT MODULE - 2/11/95 10.46.19.

PRINTED REPORT NO. 1 - SUMMARY

INNER BOT IND-PRESENT HULL LOADS IND-CALC
STIFFENER SHAPE IND-CALC

HULL STRENGTH AND STRESS

| | | | |
|---|---|---|---|
| HOGGING BM, FT-LTON | 65606. | PRIM STRESS KEEL-HOG, KSI | 15.46 |
| SAGGING BM, FT-LTON | 54696. | PRIM STRESS KEEL-SAG, KSI | 12.89 |
| MIDSHIP MOI, FT2-IN2 | 139568. | PRIM STRESS DECK-HOG, KSI | 16.14 |
| DIST N.A. TO KEEL, FT | 14.68 | PRIM STRESS DECK-SAG, KSI | 13.45 |
| DIST N.A. TO DECK, FT | 15.33 | HULL MARGIN STRESS, KSI | 2.24 |
| SEC MOD TO KEEL, FT-IN2 | 9507. | SEC MOD TO DECK, FT-IN2 | 9106. |

HULL STRUCTURE COMPONENTS

| | MATERIAL TYPE | NO OF SEGMENT | NO |
|---|---|---|---|
| WET. DECK | HTS | 4 | 1 |
| SIDE SHELL | HTS | 4 | 1 |
| BOTTOM SHELL | HTS | 6 | 1 |
| INNER BOTTOM | HTS | 5 | 1 |
| INT. DECK | HTS | 4 | 2 |
| STRINGER, SHEER | HTS | 1 | 1 |
| LONG BULKHEAD | | | 0 |
| TRANS BULKHEAD | HTS | | 13 |

HULL STRUCTURE WEIGHT

| SWBS | COMPONENT | WEIGHT, LTON | VCG, FT |
|---|---|---|---|
| 100 | HULL STRUCTURE | 759.2 | 18.72 |
| 110 | SHELL+SUPPORT | 362.0 | 13.95 |
| 120 | HULL STRUCTURAL BHD | 78.0 | 18.79 |
| 130 | HULL DECKS | 261.0 | 26.76 |
| 140 | HULL PLATFORM/FLATS | 58.2 | 12.21 |

PRINTED REPORT NO. 2 - HULL STRUCTURES WEIGHT

| SWBS | COMPONENT | WT-LTON | VCG-FT |
|---|---|---|---|
| 100 | HULL STRUCTURES | 759.2 | 18.72 |
| 110 | SHELL + SUPPORTS | 362.0 | 13.95 |
| 111 | PLATING | 218.6 | 18.75 |
| 113 | INNER BOTTOM | 36.5 | 4.50 |
| 115 | STANCHIONS | 5.1 | 15.00 |
| 116 | LONG FRAMING | 63.8 | 1.47 |
| 117 | TRANS FRAMING | 38.1 | 16.24 |
| 120 | HULL STRUCTURAL BULKHDS | 78.0 | 18.79 |
| 121 | LONG BULKHDS | | |
| 122 | TRANS BULKHDS | 66.6 | 18.79 |
| 123 | TRUNKS + ENCLOSURES | 11.3 | 18.79 |
| 130 | HULL DECKS | 261.0 | 26.76 |
| 131 | MAIN DECK | 153.3 | 31.05 |
| 132 | 2ND DECK | 107.7 | 20.66 |
| 133 | 3RD DECK | | |
| 134 | 4TH DECK | | |
| 135 | 5TH DECK+DECKS BELOW | | |
| 136 | 01 HULL DECK | | |
| 140 | HULL PLATFORMS/FLATS | 58.2 | 12.21 |
| 141 | 1ST PLATFORM | 58.2 | 12.21 |
| 142 | 2ND PLATFORM | | |
| 143 | 3RD PLATFORM | | |
| 144 | 4TH PLATFORM | | |
| 145 | 5TH PLAT+PLATS BELOW | | |

* DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS

PRINTED REPORT NO. 3 - WEATHER DECK

DECK MTRL TYPE-HTS
STRINGER PLATE MTRL TYPE-HTS

| | SHELL | STRINGER PLATE |
|---|---|---|
| MODULUS OF ELASTICITY, KSI | 29600.0 | 29600.0 |
| DENSITY, LBM/FT3 | 489.02 | 489.02 |
| YIELD STRENGTH, KSI | 45.00 | 45.00 |
| MAX PRIMARY STRENGTH, KSI | 21.28 | 21.28 |
| ALLOWABLE WORKING STRENGTH, KSI | 38.00 | 38.00 |

HULL LOADS IND-CALC

| | MAX | MIN |
|---|---|---|
| STIFFENER SPACING, IN | 24.00 | 24.00 |
| STRINGER PLATE WIDTH, FT | 6.00 | |

SEGMENT GEOMETRY

| SEG | YIB | ZIB | YOB | ZOB | HEAD1 | HEAD2 |
|---|---|---|---|---|---|---|
| | --------NODE COORD, FT | | | | SCND. LOAD, FT-- | |
| 1 | 0.00 | 30.01 | 6.86 | 30.01 | 8.25 | |
| 2 | 6.86 | 30.01 | 13.72 | 30.01 | 8.25 | |
| 3 | 13.72 | 30.01 | 20.58 | 30.01 | 8.25 | |
| 4 | 20.58 | 30.01 | 27.44 | 30.01 | 8.25 | |

SEGMENT SCANTLINGS

| SEG | STIFFENERS INXINXIN/IN | | | | CATLG NO | NO.OF STIFF | PLATE TK, IN | SPACING IN |
|---|---|---|---|---|---|---|---|---|
| 1 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 3 | 0.3438 | 20.58 |
| 2 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 3 | 0.3438 | 20.58 |
| 3 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 3 | 0.3438 | 20.58 |
| 4 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 3 | 0.3438 | 20.58 |

NOTE: *R STANDS FOR ROLLED SHAPE

SEGMENT PROPERTIES

| SEG | AREA TOTAL IN2 | AREA SHEAR IN2 | N.A. TO PLATE IN | SEC MOD PLATE IN3 | SEC MOD FLANGE IN3 | WT/FT LBF/FT | SMEAR RATIO |
|---|---|---|---|---|---|---|---|
| 1 | 8.52 | 0.73 | 0.70 | 19.92 | 3.91 | 28.92 | 0.20 |
| 2 | 8.52 | 0.73 | 0.70 | 19.92 | 3.91 | 28.92 | 0.20 |
| 3 | 8.52 | 0.73 | 0.70 | 19.92 | 3.91 | 28.92 | 0.20 |
| 4 | 8.52 | 0.73 | 0.70 | 19.92 | 3.91 | 28.92 | 0.20 |

PRINTED REPORT NO. 4 - SIDE SHELL

SIDE SHELL MTRL TYPE-HTS
SHEER STRAKE MTRL TYPE-HTS

| | SHELL | SHEER STRAKE |
|---|---|---|
| MODULUS OF ELASTICITY, KSI | 29600.0 | 29600.0 |
| DENSITY, LBM/FT3 | 489.02 | 489.02 |
| YIELD STRENGTH, KSI | 45.00 | 45.00 |
| MAX PRIMARY STRENGTH, KSI | 21.28 | 21.28 |
| ALLOWABLE WORKING STRENGTH, KSI | 38.00 | 38.00 |

HULL LOADS IND-CALC

| | MAX | MIN |
|---|---|---|
| STIFFENER SPACING, IN | 24.00 | 24.00 |
| SHEER STRAKE WIDTH, FT | 6.00 | |

SEGMENT GEOMETRY

| SEG | YUPR | ZUPR | YLWR | ZLWR | HEAD1 | HEAD2 |
|---|---|---|---|---|---|---|
| | --------NODE COORD, FT | | | | SCND. LOAD, FT-- | |
| 1 | 27.44 | 30.01 | 26.55 | 24.01 | 7.81 | |
| 2 | 26.55 | 24.01 | 25.91 | 20.00 | 12.00 | |
| 3 | 25.91 | 20.00 | 24.58 | 12.25 | 17.89 | |
| 4 | 24.58 | 12.25 | 20.81 | 6.00 | 25.20 | |

SEGMENT SCANTLINGS

| SEG | STIFFENERS INXINXIN/IN | | | | CATLG NO | NO.OF STIFF | PLATE TK, IN | SPACING IN |
|---|---|---|---|---|---|---|---|---|
| 1 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 4 | 0.2500 | 18.20 |
| 2 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 2 | 0.2500 | 16.24 |
| 3 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 3 | 0.2813 | 23.60 |
| 4 *R | 4.730X | 3.960X | 0.190/ | 0.210 | 2. | 4 | 0.3125 | 22.33 |

NOTE: *R STANDS FOR ROLLED SHAPE

SEGMENT PROPERTIES

| SEG | AREA TOTAL IN2 | AREA SHEAR IN2 | N.A. TO PLATE IN | SEC MOD PLATE IN3 | SEC MOD FLANGE IN3 | WT/FT LBF/FT | SMEAR RATIO |
|---|---|---|---|---|---|---|---|
| 1 | 5.99 | 0.71 | 0.87 | 14.53 | 3.80 | 20.34 | 0.32 |
| 2 | 5.50 | 0.71 | 0.94 | 13.18 | 3.79 | 18.68 | 0.35 |
| 3 | 8.08 | 0.72 | 0.70 | 19.58 | 3.86 | 27.43 | 0.22 |
| 4 | 8.71 | 1.00 | 0.89 | 26.20 | 5.36 | 29.57 | 0.25 |

PRINTED REPORT NO. 5 - BOTTOM SHELL

BOTTOM SHELL MTRL TYPE-HTS

| | |
|---|---|
| MODULUS OF ELASTICITY, KSI | 29600.0 |
| DENSITY, LBM/FT3 | 489.02 |
| YIELD STRENGTH, KSI | 45.00 |
| MAX PRIMARY STRENGTH, KSI | 21.28 |
| ALLOWABLE WORKING STRENGTH, KSI | 38.00 |

HULL LOADS IND-CALC

| | MAX | MIN |
|---|---|---|
| STIFFENER SPACING, IN | 24.00 | 24.00 |

SEGMENT GEOMETRY

| | --------NODE COORD, FT | | | ------------------- | -SCND. LOAD, FT-- | |
|---|---|---|---|---|---|---|
| SEG | YUPR | ZUPR | YLWR | ZLWR | HEAD1 | HEAD2 |
| 1 | 20.81 | 6.00 | 18.61 | 4.50 | 28.83 | |
| 2 | 18.61 | 4.50 | 16.46 | 3.44 | 30.06 | |
| 3 | 16.46 | 3.44 | 12.35 | 2.00 | 31.35 | |
| 4 | 12.35 | 2.00 | 8.23 | 0.99 | 32.55 | |
| 5 | 8.23 | 0.99 | 4.12 | 0.31 | 33.39 | |
| 6 | 4.12 | 0.31 | 0.00 | 0.00 | 33.89 | |

SEGMENT SCANTLINGS

| | -----------------SCANTLINGS OF STIFFENED PLATES----------------- | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | STIFFENERS | | | | CATLG | NO.OF | PLATE | SPACING |
| SEG | ---------INXINXIN/IN-------------- | | | | NO | STIFF | TK, IN | IN |
| 1 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 1 | 0.3438 | 16.03 |
| 2 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 1 | 0.3438 | 14.21 |
| 3 *R | 4.730X | 3.960X | 0.190/ | 0.210 | 2. | 2 | 0.3438 | 17.45 |
| 4 *R | 4.730X | 3.960X | 0.190/ | 0.210 | 2. | 2 | 0.3438 | 17.03 |
| 5 *R | 4.730X | 3.960X | 0.190/ | 0.210 | 2. | 2 | 0.3438 | 16.49 |
| 6 *R | 4.730X | 3.960X | 0.190/ | 0.210 | 2. | 1 | 0.3438 | 19.14 |

NOTE: *R STANDS FOR ROLLED SHAPE

SEGMENT PROPERTIES

| | -----------------PROPERTIES OF STIFFENED PLATES------------------ | | | | | | |
|---|---|---|---|---|---|---|---|
| | ------AREA------ | | N.A. TO | -----SEC MOD----- | | | SMEAR |
| | TOTAL | SHEAR | PLATE | PLATE | FLANGE | WT/FT | RATIO |
| SEG | IN2 | IN2 | IN | IN3 | IN3 | LBF/FT | |
| 1 | 6.95 | 0.73 | 0.82 | 16.36 | 3.89 | 23.60 | 0.26 |
| 2 | 6.33 | 0.73 | 0.89 | 14.84 | 3.88 | 21.48 | 0.29 |
| 3 | 7.73 | 1.00 | 1.00 | 22.85 | 5.37 | 26.25 | 0.29 |
| 4 | 7.59 | 1.00 | 1.02 | 22.39 | 5.36 | 25.76 | 0.30 |
| 5 | 7.40 | 1.00 | 1.04 | 21.80 | 5.36 | 25.13 | 0.31 |
| 6 | 8.31 | 1.00 | 0.95 | 24.65 | 5.38 | 28.22 | 0.26 |

PRINTED REPORT NO. 6 - INNER BOTTOM

INNER BOT IND-PRESENT

INNER BOTTOM MTRL TYPE-HTS

| | |
|---|---|
| MODULUS OF ELASTICITY, KSI | 29600.0 |
| DENSITY, LBM/FT3 | 489.02 |
| YIELD STRENGTH, KSI | 45.00 |
| MAX PRIMARY STRENGTH, KSI | 21.28 |
| ALLOWABLE WORKING STRENGTH, KSI | 38.00 |

HULL LOADS IND-CALC

| | MAX | MIN |
|---|---|---|
| STIFFENER SPACING, IN | 24.00 | 24.00 |

SEGMENT GEOMETRY

| | --------NODE COORD, FT | | | ------------------- | -SCND. LOAD, FT-- | |
|---|---|---|---|---|---|---|
| SEG | YUPR | ZUPR | YLWR | ZLWR | HEAD1 | HEAD2 |
| 1 | 18.61 | 4.50 | 16.46 | 4.50 | 2.62 | 30.92 |
| 2 | 16.46 | 4.50 | 12.35 | 4.50 | 2.70 | 29.44 |
| 3 | 12.35 | 4.50 | 8.23 | 4.50 | 2.70 | 27.38 |
| 4 | 8.23 | 4.50 | 4.12 | 4.50 | 2.70 | 25.32 |
| 5 | 4.12 | 4.50 | 0.00 | 4.50 | 2.70 | 23.26 |

SEGMENT SCANTLINGS

| SEG | STIFFENERS IN X IN X IN/IN | | | | CATLG NO | NO.OF STIFF | PLATE TK, IN | SPACING IN |
|---|---|---|---|---|---|---|---|---|
| 1 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 1 | 0.2188 | 12.87 |
| 2 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 2 | 0.2500 | 16.46 |
| 3 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 2 | 0.2500 | 16.46 |
| 4 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 2 | 0.2500 | 16.46 |
| 5 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 2 | 0.2500 | 16.46 |

NOTE: *R STANDS FOR ROLLED SHAPE

SEGMENT PROPERTIES

| SEG | AREA TOTAL IN2 | AREA SHEAR IN2 | N.A. TO PLATE IN | SEC MOD PLATE IN3 | SEC MOD FLANGE IN3 | WT/FT LBF/FT | SMEAR RATIO |
|---|---|---|---|---|---|---|---|
| 1 | 4.26 | 0.71 | 1.15 | 9.70 | 3.72 | 14.45 | 0.51 |
| 2 | 5.56 | 0.71 | 0.93 | 13.34 | 3.79 | 18.87 | 0.35 |
| 3 | 5.56 | 0.71 | 0.93 | 13.34 | 3.79 | 18.87 | 0.35 |
| 4 | 5.56 | 0.71 | 0.93 | 13.34 | 3.79 | 18.87 | 0.35 |
| 5 | 5.56 | 0.71 | 0.93 | 13.34 | 3.79 | 18.87 | 0.35 |

PRINTED REPORT NO. 7 - INTERNAL DECKS

NUMBER OF INTERNAL DECKS 2

INTERNAL DECK MTRL TYPE-HTS

| | |
|---|---|
| MODULUS OF ELASTICITY, KSI | 29600.0 |
| DENSITY, LBM/FT3 | 489.02 |
| YIELD STRENGTH, KSI | 45.00 |
| MAX PRIMARY STRENGTH, KSI | 21.28 |
| ALLOWABLE WORKING STRENGTH, KSI | 38.00 |

HULL LOADS IND-CALC

| | MAX | MIN |
|---|---|---|
| STIFFENER SPACING, IN | 24.00 | 24.00 |

SEGMENT GEOMETRY

| SEG | NODE COORD, FT YIB | ZIB | YOB | ZOB | SCND. LOAD, FT HEAD1 | HEAD2 |
|---|---|---|---|---|---|---|
| DECK NO.1 | | | | | | |
| SEG | | | | | | |
| 1 | 0.00 | 20.00 | 6.86 | 20.00 | 2.67 | 17.21 |
| 2 | 6.86 | 20.00 | 13.72 | 20.00 | 2.67 | 20.64 |
| 3 | 13.72 | 20.00 | 20.58 | 20.00 | 2.67 | 25.07 |
| 4 | 20.58 | 20.00 | 25.91 | 20.00 | 2.72 | 20.46 |
| DECK NO.2 | | | | | | |
| SEG | | | | | | |
| 1 | 0.00 | 12.25 | 6.86 | 12.25 | 2.67 | 17.21 |
| 2 | 6.86 | 12.25 | 13.72 | 12.25 | 2.67 | 20.64 |
| 3 | 13.72 | 12.25 | 24.58 | 12.25 | 2.67 | 25.07 |

SEGMENT SCANTLINGS

| SEG | STIFFENERS IN X IN X IN/IN | | | | CATLG NO | NO.OF STIFF | PLATE TK, IN | SPACING IN |
|---|---|---|---|---|---|---|---|---|
| DECK NO.1 | | | | | | | | |
| SEG | | | | | | | | |
| 1 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 3 | 0.2188 | 20.58 |
| 2 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 3 | 0.2188 | 20.58 |
| 3 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 3 | 0.2188 | 20.58 |
| 4 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 2 | 0.2813 | 21.32 |
| DECK NO.2 | | | | | | | | |
| SEG | | | | | | | | |
| 1 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 3 | 0.2188 | 20.58 |
| 2 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 3 | 0.2188 | 20.58 |
| 3 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 5 | 0.2188 | 21.72 |

NOTE: *R STANDS FOR ROLLED SHAPE

SEGMENT PROPERTIES

| | PROPERTIES OF STIFFENED PLATES | | | | | | |
|---|---|---|---|---|---|---|---|
| | AREA | | N.A. TO | SEC MOD | | | SMEAR |
| | TOTAL | SHEAR | PLATE | PLATE | FLANGE | WT/FT | RATIO |
| SEG | IN2 | IN2 | IN | IN3 | IN3 | LBF/FT | |
| DECK NO.1 | | | | | | | |
| SEG | | | | | | | |
| 1 | 5.94 | 0.71 | 0.86 | 14.60 | 3.78 | 20.18 | 0.32 |
| 2 | 5.94 | 0.71 | 0.86 | 14.60 | 3.78 | 20.18 | 0.32 |
| 3 | 5.94 | 0.71 | 0.86 | 14.60 | 3.78 | 20.18 | 0.32 |
| 4 | 7.44 | 0.72 | 0.74 | 18.03 | 3.85 | 25.25 | 0.24 |
| DECK NO.2 | | | | | | | |
| SEG | | | | | | | |
| 1 | 5.94 | 0.71 | 0.86 | 14.60 | 3.78 | 20.18 | 0.32 |
| 2 | 5.94 | 0.71 | 0.86 | 14.60 | 3.78 | 20.18 | 0.32 |
| 3 | 6.19 | 0.71 | 0.83 | 15.29 | 3.79 | 21.03 | 0.30 |

PRINTED REPORT NO. 8 - STRENGTH AND STRESS OF STIFFENED PLATE AT DESIGN LOAD

INNER BOT IND-PRESENT

| SEG | PRIMARY STRESS | | LOCAL STRESS | | STRENGTH | | |
|---|---|---|---|---|---|---|---|
| | TENSION | COMP. | BEND. | SHEAR | BUCKL. | ULTIMATE | COLUMN |
| | KSI | KSI | KSI | KSI | KSI | KSI | KSI |
| WET DECK | | | | | | | |
| 1 | 16.11 | 13.43 | 6.61 | 2.22 | 29.86 | 33.05 | 33.54 |
| 2 | 16.11 | 13.43 | 6.61 | 2.22 | 29.86 | 33.05 | 33.54 |
| 3 | 16.11 | 13.43 | 6.61 | 2.22 | 29.86 | 33.05 | 33.54 |
| 4 | 16.11 | 13.43 | 6.61 | 2.22 | 29.86 | 33.05 | 33.54 |
| SIDE SHELL | | | | | | | |
| 1 | 14.53 | 12.27 | 5.69 | 1.90 | 20.20 | 28.69 | 36.11 |
| 2 | 11.95 | 10.38 | 7.84 | 2.60 | 25.37 | 31.21 | 36.70 |
| 3 | 8.90 | 8.14 | 16.66 | 5.59 | 15.21 | 25.70 | 33.81 |
| 4 | 9.81 | 10.47 | 15.99 | 5.37 | 20.96 | 29.10 | 38.31 |
| BOT SHELL | | | | | | | |
| 1 | 10.94 | 12.35 | 18.10 | 6.03 | 38.99 | 38.68 | 35.27 |
| 2 | 11.32 | 12.99 | 16.79 | 5.57 | 41.08 | 41.17 | 35.98 |
| 3 | 11.72 | 13.66 | 15.54 | 5.19 | 36.98 | 36.79 | 39.15 |
| 4 | 12.09 | 14.28 | 15.76 | 5.26 | 37.60 | 37.34 | 39.27 |
| 5 | 12.35 | 14.72 | 15.67 | 5.22 | 38.37 | 38.06 | 39.43 |
| 6 | 12.50 | 14.98 | 18.38 | 6.16 | 34.25 | 34.71 | 38.69 |
| INNER BOT | | | | | | | |
| 1 | 11.15 | 12.71 | 16.31 | 5.35 | 30.95 | 33.46 | 38.13 |
| 2 | 11.15 | 12.71 | 19.48 | 6.47 | 24.67 | 30.90 | 36.63 |
| 3 | 11.15 | 12.71 | 18.12 | 6.01 | 24.67 | 30.90 | 36.63 |
| 4 | 11.15 | 12.71 | 16.76 | 5.56 | 24.67 | 30.90 | 36.63 |
| 5 | 11.15 | 12.71 | 15.39 | 5.11 | 24.67 | 30.90 | 36.63 |
| INT DECK NO. 1 | | | | | | | |
| 1 | 10.91 | 9.62 | 14.27 | 4.76 | 12.10 | 23.43 | 36.08 |
| 2 | 10.91 | 9.62 | 17.12 | 5.71 | 12.10 | 23.43 | 36.08 |
| 3 | 10.91 | 9.62 | 20.79 | 6.94 | 12.10 | 23.43 | 36.08 |
| 4 | 10.91 | 9.62 | 17.25 | 5.78 | 18.63 | 27.82 | 34.52 |
| INT DECK NO. 2 | | | | | | | |
| 1 | 0.00 | 0.00 | 14.27 | 4.76 | 12.10 | 23.43 | 36.08 |
| 2 | 0.00 | 0.00 | 17.12 | 5.71 | 12.10 | 23.43 | 36.08 |
| 3 | 0.00 | 0.00 | 21.90 | 7.32 | 10.86 | 22.41 | 35.78 |

PRINTED REPORT NO. 9 - FACTOR OF SAFETY OF STIFFENED PLATE AT DESIGN LOAD

INNER BOT IND-PRESENT

| SEG | --PLATE- BUCKLING | -STIFFENER- SHEAR | --------STIFFENED PLATE----------- COMP+BEND | ULTIMATE | TENSION+BEND. |
|---|---|---|---|---|---|
| WET DECK | | | | | |
| 1 | 2.12 | 10.29 | 1.30 | 1.40 | 1.67 |
| 2 | 2.12 | 10.29 | 1.30 | 1.40 | 1.67 |
| 3 | 2.12 | 10.29 | 1.30 | 1.40 | 1.67 |
| 4 | 2.12 | 10.29 | 1.30 | 1.40 | 1.67 |
| SIDE SHELL | | | | | |
| 1 | 1.55 | 12.03 | 1.52 | 1.41 | 1.88 |
| 2 | 2.20 | 8.77 | 1.59 | 1.76 | 1.92 |
| 3 | 1.55 | 4.08 | 1.25 | 1.57 | 1.49 |
| 4 | 1.72 | 4.24 | 1.31 | 1.63 | 1.47 |
| BOT SHELL | | | | | |
| 1 | 2.68 | 3.78 | 1.00 | 1.67 | 1.31 |
| 2 | 2.70 | 4.09 | 1.02 | 1.73 | 1.35 |
| 3 | 2.38 | 4.39 | 1.18 | 1.65 | 1.39 |
| 4 | 2.32 | 4.33 | 1.15 | 1.61 | 1.36 |
| 5 | 2.30 | 4.36 | 1.14 | 1.60 | 1.36 |
| 6 | 2.01 | 3.70 | 1.03 | 1.40 | 1.23 |
| INNER BOT | | | | | |
| 1 | 9.64 | 4.26 | 2.33 | 7.07 | 2.33 |
| 2 | 8.68 | 3.53 | 1.95 | 7.08 | 1.95 |
| 3 | 9.33 | 3.79 | 2.10 | 7.61 | 2.10 |
| 4 | 10.09 | 4.10 | 2.27 | 8.23 | 2.27 |
| 5 | 10.98 | 4.46 | 2.47 | 8.95 | 2.47 |
| INT DECK NO. 1 | | | | | |
| 1 | 6.37 | 4.79 | 2.66 | 7.91 | 2.66 |
| 2 | 5.31 | 3.99 | 2.22 | 6.60 | 2.22 |
| 3 | 4.37 | 3.29 | 1.83 | 5.43 | 1.83 |
| 4 | 9.84 | 3.95 | 2.20 | 9.02 | 2.20 |
| INT DECK NO. 2 | | | | | |
| 1 | 6.37 | 4.79 | 2.66 | 7.91 | 2.66 |
| 2 | 5.31 | 3.99 | 2.22 | 6.60 | 2.22 |
| 3 | 3.90 | 3.12 | 1.73 | 5.11 | 1.73 |

PRINTED REPORT NO. 10 - GIRDER PROPERTIES, STRENGTH ,STRESSES AND FACTOR OF SAFETY

DECK MTRL TYPE-HTS
BOT MTRL TYPE-HTS

HULL LOADS IND-CALC
GIRDER/STIFF.,POSITION

| | ------COORDINATE, FT----- YLOC | ZLOC | --SCND. LOAD, FT-- HEAD1 | HEAD2 |
|---|---|---|---|---|
| WET DECK GIRDER | | | | |
| 1 | 0.00 | 30.01 | 8.40 | |
| 2 | 6.86 | 30.01 | 8.40 | |
| 3 | 13.72 | 30.01 | 8.40 | |
| 4 | 20.58 | 30.01 | 8.40 | |
| INT DECK 1. GIRDER | | | | |
| 1 | 0.00 | 20.00 | 2.70 | 8.82 |
| 2 | 6.86 | 20.00 | 2.70 | 12.25 |
| 3 | 13.72 | 20.00 | 2.70 | 15.68 |
| 4 | 20.58 | 20.00 | 2.70 | 19.11 |
| INT DECK 2. GIRDER | | | | |
| 1 | 0.00 | 12.25 | 2.70 | 15.53 |
| 2 | 6.86 | 12.25 | 2.70 | 18.96 |
| 3 | 13.72 | 12.25 | 2.70 | 22.39 |
| BOTTOM GIRDER | | | | |
| 1 | 0.00 | 0.00 | 0.29 | 34.01 |
| 2 | 4.12 | 0.31 | 0.29 | 33.70 |
| 3 | 8.23 | 0.99 | 0.29 | 33.02 |
| 4 | 12.35 | 2.00 | 0.29 | 32.01 |
| 5 | 16.46 | 3.44 | 0.29 | 31.31 |
| BOTTOM STIFF. | | | | |
| 1 | 0.00 | 2.25 | 0.29 | 31.76 |
| 2 | 4.12 | 2.41 | 0.27 | 31.60 |
| 3 | 8.23 | 2.75 | 0.21 | 31.26 |

| | | | | |
|---|---|---|---|---|
| 4 | 12.35 | 3.25 | 0.21 | 30.76 |
| 5 | 16.46 | 3.97 | 0.21 | 30.77 |

| | GIRDER/STIFFENER | ------------INXINXIN/IN------------ | | | CATLG NO | PLATE TK, IN | SUPPORT WIDTH IN |
|---|---|---|---|---|---|---|---|
| GIRDER | | | | | | | |
| 1 *F | 13.490X | 5.030X | 0.255/ | 0.420 | 49. | 0.3438 | 82.32 |
| 2 *F | 13.490X | 5.030X | 0.255/ | 0.420 | 49. | 0.3438 | 82.32 |
| 3 *F | 13.490X | 5.030X | 0.255/ | 0.420 | 49. | 0.3438 | 82.32 |
| 4 *F | 13.490X | 5.030X | 0.255/ | 0.420 | 49. | 0.3438 | 82.32 |
| INT DECK 1. | | | | | | | |
| GIRDER | | | | | | | |
| 1 *F | 9.780X | 4.010X | 0.240/ | 0.330 | 29. | 0.2188 | 82.32 |
| 2 *F | 11.810X | 4.010X | 0.235/ | 0.350 | 35. | 0.2188 | 82.32 |
| 3 *F | 11.840X | 6.490X | 0.230/ | 0.380 | 45. | 0.2188 | 82.32 |
| 4 *F | 11.840X | 6.490X | 0.230/ | 0.380 | 45. | 0.2188 | 73.14 |
| INT DECK 2. | | | | | | | |
| GIRDER | | | | | | | |
| 1 *F | 11.840X | 6.490X | 0.230/ | 0.380 | 45. | 0.2188 | 82.32 |
| 2 *F | 13.490X | 5.030X | 0.255/ | 0.420 | 49. | 0.2188 | 82.32 |
| 3 *F | 15.430X | 6.990X | 0.295/ | 0.430 | 67. | 0.2188 | 106.31 |
| BOTTOM | | | | | | | |
| GIRDER | | | | | | | |
| 1 | 54.000X | 17.190X | 0.344/ | 0.250 | | 0.3438 | 38.28 |
| 2 | 50.276X | 15.625X | 0.313/ | 0.250 | | 0.3438 | 43.87 |
| 3 | 42.085X | 12.500X | 0.250/ | 0.250 | | 0.3438 | 50.28 |
| 4 | 30.031X | 12.500X | 0.250/ | 0.250 | | 0.3438 | 51.73 |
| 5 | 12.745X | 12.500X | 0.250/ | 0.219 | | 0.3438 | 52.36 |
| BOTTOM | | | | | | | |
| STIFF. | | | | | | | |
| 1 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 0.3438 | 27.00 |
| 2 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 0.3125 | 27.00 |
| 3 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 0.2500 | 27.00 |
| 4 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 0.2500 | 27.00 |
| 5 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 0.2500 | 27.00 |

NOTE: *F STANDS FOR FABRICATED SHAPE
*R STANDS FOR ROLLED SHAPE

----------------PROPERTIES OF GDR/STF AND PLATES----------------

| | ------AREA------ TOTAL IN2 | SHEAR IN2 | N.A. TO PLATE IN | -----SEC MOD----- PLATE IN3 | FLANGE IN3 | WT/FT LBF/FT | SMEAR RATIO |
|---|---|---|---|---|---|---|---|
| WET DECK | | | | | | | |
| GIRDER | | | | | | | |
| 1 | 33.85 | 3.63 | 1.74 | 310.30 | 43.13 | 114.96 | 0.20 |
| 2 | 33.85 | 3.63 | 1.74 | 310.30 | 43.13 | 114.96 | 0.20 |
| 3 | 33.85 | 3.63 | 1.74 | 310.30 | 43.13 | 114.96 | 0.20 |
| 4 | 33.85 | 3.63 | 1.74 | 310.30 | 43.13 | 114.96 | 0.20 |
| INT DECK 1. | | | | | | | |
| GIRDER | | | | | | | |
| 1 | 21.68 | 2.48 | 1.26 | 144.09 | 20.09 | 73.63 | 0.20 |
| 2 | 22.19 | 2.91 | 1.63 | 176.39 | 26.70 | 75.36 | 0.23 |
| 3 | 23.20 | 2.86 | 2.11 | 190.55 | 38.86 | 78.79 | 0.29 |
| 4 | 21.19 | 2.86 | 2.30 | 171.01 | 38.72 | 71.97 | 0.32 |
| INT DECK 2. | | | | | | | |
| GIRDER | | | | | | | |
| 1 | 23.20 | 2.86 | 2.11 | 190.55 | 38.86 | 78.79 | 0.29 |
| 2 | 23.56 | 3.60 | 2.35 | 212.34 | 42.30 | 80.01 | 0.31 |
| 3 | 30.82 | 4.74 | 2.80 | 318.24 | 67.18 | 104.66 | 0.33 |
| BOTTOM | | | | | | | |
| GIRDER | | | | | | | |
| 1 | 28.77 | 18.77 | 25.81 | 463.68 | 415.90 | 97.71 | 0.00 |
| 2 | 24.99 | 15.90 | 23.99 | 383.00 | 341.82 | 84.86 | 0.00 |
| 3 | 17.94 | 10.67 | 19.99 | 242.71 | 213.88 | 60.94 | 0.00 |
| 4 | 14.93 | 7.66 | 14.16 | 158.96 | 136.65 | 50.70 | 0.00 |
| 5 | 10.22 | 3.33 | 5.70 | 58.18 | 43.58 | 34.70 | 0.00 |
| BOTTOM | | | | | | | |
| STIFF. | | | | | | | |
| 1 | 10.72 | 0.73 | 0.60 | 24.43 | 3.93 | 36.41 | 0.16 |
| 2 | 9.88 | 0.72 | 0.61 | 23.21 | 3.90 | 33.54 | 0.17 |
| 3 | 8.19 | 0.71 | 0.67 | 20.21 | 3.84 | 27.81 | 0.21 |
| 4 | 8.19 | 0.71 | 0.67 | 20.21 | 3.84 | 27.81 | 0.21 |
| 5 | 8.19 | 0.71 | 0.67 | 20.21 | 3.84 | 27.81 | 0.21 |

---------------SCANTLINGS OF GDR/STF AND PLATE-------------

-----------------STRENGTH AND STRESSES OF GDR.STF------------
AT DESIGN LOAD

| | -PRIMARY STRESS- TENSION KSI | COMP. KSI | -LOCAL STRESS- BEND. KSI | SHEAR KSI | --------STRENGTH-------- BUCKL. KSI | ULTIMATE KSI | COLUMN KSI |
|---|---|---|---|---|---|---|---|
| WET DECK | | | | | | | |
| GIRDER | | | | | | | |
| 1 | 16.11 | 13.43 | 16.01 | 4.64 | 35.83 | 35.87 | 37.43 |
| 2 | 16.11 | 13.43 | 16.01 | 4.64 | 35.83 | 35.87 | 37.43 |
| 3 | 16.11 | 13.43 | 16.01 | 4.64 | 35.83 | 35.87 | 37.43 |
| 4 | 16.11 | 13.43 | 16.01 | 4.64 | 35.83 | 35.87 | 37.43 |
| INT DECK 1. | | | | | | | |
| GIRDER | | | | | | | |
| 1 | 10.91 | 9.62 | 36.11 | 7.14 | 41.28 | 41.44 | 30.58 |
| 2 | 10.91 | 9.62 | 37.73 | 8.45 | 37.24 | 37.02 | 35.43 |
| 3 | 10.91 | 9.62 | 33.19 | 11.00 | 36.60 | 36.48 | 38.16 |
| 4 | 10.91 | 9.62 | 36.06 | 11.91 | 36.60 | 36.48 | 38.74 |
| INT DECK 2. | | | | | | | |
| GIRDER | | | | | | | |
| 1 | 0.00 | 0.00 | 32.87 | 10.90 | 36.60 | 36.48 | 38.16 |
| 2 | 0.00 | 0.00 | 36.86 | 10.57 | 35.83 | 35.87 | 39.82 |
| 3 | 0.00 | 0.00 | 35.40 | 12.24 | 36.16 | 36.12 | 42.11 |
| BOTTOM | | | | | | | |
| GIRDER | | | | | | | |
| 1 | 12.54 | 15.04 | 0.03 | 0.01 | 17.35 | 27.07 | 45.00 |
| 2 | 12.44 | 14.88 | 0.04 | 0.02 | 16.54 | 26.56 | 45.00 |
| 3 | 12.23 | 14.53 | 7.75 | 3.79 | 15.11 | 25.63 | 45.00 |
| 4 | 11.92 | 14.00 | 12.11 | 5.27 | 29.66 | 32.98 | 45.00 |
| 5 | 11.48 | 13.26 | 37.59 | 12.02 | 44.39 | 45.00 | 42.86 |
| BOTTOM | | | | | | | |
| STIFF. | | | | | | | |
| 1 | 11.84 | 13.87 | 33.24 | 11.19 | 44.66 | 45.00 | 31.28 |
| 2 | 11.79 | 13.79 | 33.33 | 11.22 | 44.66 | 45.00 | 32.01 |
| 3 | 11.69 | 13.62 | 33.49 | 11.26 | 44.66 | 45.00 | 33.58 |
| 4 | 11.53 | 13.35 | 32.95 | 11.08 | 44.66 | 45.00 | 33.58 |
| 5 | 11.31 | 12.98 | 32.96 | 11.09 | 44.66 | 45.00 | 33.58 |

------------------FACTOR OF SAFETY OF GDR.STF----------
AT DESIGN LOAD

| | --PLATE- BUCKLING | -STIFFENER- SHEAR | --------STIFFENED PLATE----------- COMP+BEND | ULTIMATE | TENSION+BEND. |
|---|---|---|---|---|---|
| WET DECK | | | | | |
| GIRDER | | | | | |
| 1 | 2.46 | 4.92 | 1.05 | 1.64 | 1.18 |
| 2 | 2.46 | 4.92 | 1.05 | 1.64 | 1.18 |
| 3 | 2.46 | 4.92 | 1.05 | 1.64 | 1.18 |
| 4 | 2.46 | 4.92 | 1.05 | 1.64 | 1.18 |
| INT DECK 1. | | | | | |
| GIRDER | | | | | |
| 1 | 15.97 | 3.19 | 1.05 | 8.72 | 1.05 |
| 2 | 12.70 | 2.70 | 1.01 | 7.95 | 1.01 |
| 3 | 10.53 | 2.07 | 1.15 | 7.12 | 1.15 |
| 4 | 8.73 | 1.91 | 1.05 | 5.99 | 1.05 |
| INT DECK 2. | | | | | |
| GIRDER | | | | | |
| 1 | 10.63 | 2.09 | 1.16 | 7.19 | 1.16 |
| 2 | 9.50 | 2.16 | 1.03 | 6.73 | 1.03 |
| 3 | 9.42 | 1.86 | 1.07 | 7.05 | 1.07 |
| BOTTOM | | | | | |
| GIRDER | | | | | |
| 1 | 1.15 | 1559.32 | 2.39 | 1.44 | 3.02 |
| 2 | 1.11 | 1152.26 | 2.41 | 1.43 | 3.04 |
| 3 | 4.30 | 6.01 | 4.90 | 5.84 | 4.90 |
| 4 | 5.55 | 4.32 | 3.14 | 4.94 | 3.14 |
| 5 | 3.07 | 1.90 | 1.01 | 2.37 | 1.01 |
| BOTTOM | | | | | |
| STIFF. | | | | | |
| 1 | 16.26 | 2.04 | 1.14 | 9.11 | 1.14 |
| 2 | 15.52 | 2.03 | 1.14 | 8.90 | 1.14 |
| 3 | 13.66 | 2.02 | 1.13 | 8.22 | 1.13 |
| 4 | 13.88 | 2.06 | 1.15 | 8.35 | 1.15 |
| 5 | 13.88 | 2.06 | 1.15 | 8.35 | 1.15 |

PRINTED REPORT NO. 11 - LONGITUDINAL BULKHEADS

NUMBER OF LONG BHD 0

PRINTED REPORT NO. 12 - TRANSVERSE BULKHEADS

TRANS BHD MTRL TYPE-HTS

| | |
|---|---|
| MODULUS OF ELASTICITY, KSI | 29600.0 |
| DENSITY, LBM/FT3 | 489.02 |
| YIELD STRENGTH, KSI | 45.00 |
| MAX PRIMARY STRENGTH, KSI | 21.28 |
| ALLOWABLE WORKING STRENGTH, KSI | 38.00 |

HULL LOADS IND-CALC

| | MAX | MIN |
|---|---|---|
| STIFFENER SPACING, IN | 24.00 | 24.00 |

SEGMENT GEOMETRY

| | --------NODE COORD, FT | | | -------------------- | SCND. LOAD, FT-- | |
|---|---|---|---|---|---|---|
| SEG | YUPR | ZUPR | YLWR | ZLWR | HEAD1 | HEAD2 |
| 1 | 0.00 | 30.01 | 0.00 | 20.00 | 21.57 | |
| 2 | 0.00 | 20.00 | 0.00 | 12.25 | 27.62 | |
| 3 | 0.00 | 12.25 | 0.00 | 4.50 | 31.34 | |

SEGMENT SCANTLINGS

SCANTLINGS OF STIFFENED PLATES

| SEG | STIFFENERS INXINXIN/IN | | | | CATLG NO | NO.OF STIFF | PLATE TK, IN | SPACING IN |
|---|---|---|---|---|---|---|---|---|
| 1 *F | 7.685X | 3.940X | 0.170/ | 0.205 | 6 | 16 | 0.1875 | 24.02 |
| 2 *R | 5.735X | 3.970X | 0.200/ | 0.225 | 5 | 15 | 0.1875 | 23.25 |
| 3 *F | 7.685X | 3.940X | 0.170/ | 0.205 | 6 | 15 | 0.1875 | 23.25 |

NOTE: *F STANDS FOR FABRICATED SHAPE
*R STANDS FOR ROLLED SHAPE

SEGMENT PROPERTIES

PROPERTIES OF STIFFENED PLATES

| SEG | AREA TOTAL IN2 | AREA SHEAR IN2 | N.A. TO PLATE IN | SEC MOD PLATE IN3 | SEC MOD FLANGE IN3 | WT/FT LBF/FT | SMEAR RATIO |
|---|---|---|---|---|---|---|---|
| 1 | 6.61 | 1.37 | 1.83 | 31.02 | 9.09 | 22.46 | 0.47 |
| 2 | 6.40 | 1.23 | 1.45 | 22.62 | 7.00 | 21.73 | 0.47 |
| 3 | 6.47 | 1.37 | 1.87 | 30.14 | 9.07 | 21.97 | 0.48 |

STRENGTH AND STRESSES AT DESIGN LOAD

| SEG | LOCAL STRESS BEND. KSI | LOCAL STRESS SHEAR KSI | STRENGTH BUCKL. KSI | STRENGTH ULTIMATE KSI | STRENGTH COLUMN KSI |
|---|---|---|---|---|---|
| 1 | 35.16 | 8.51 | 10.86 | 22.41 | 35.78 |
| 2 | 37.91 | 9.78 | 10.86 | 22.41 | 35.78 |
| 3 | 34.13 | 11.54 | 10.86 | 22.41 | 35.78 |

FACTOR OF SAFETY AT DESIGN LOAD

| SEG | PLATE BUCKLING | STIFFENER SHEAR | STIFFENED PLATE COMP+BEND | STIFFENED PLATE ULTIMATE | STIFFENED PLATE TENSION+BEND. |
|---|---|---|---|---|---|
| 1 | 3.90 | 2.68 | 1.08 | 5.11 | 1.73 |
| 2 | 3.90 | 2.33 | 1.00 | 5.11 | 1.73 |
| 3 | 3.90 | 1.98 | 1.11 | 5.11 | 1.73 |

PRINTED REPORT NO. 13 - SIDE AND BOTTOM FRAMES

FRAME SPACING, FT 8.00

SEGMENT GEOMETRY

| SEG | NODE COORD, FT YUPR | ZUPR | YLWR | ZLWR | SCND. LOAD, FT HEAD1 | HEAD2 |
|---|---|---|---|---|---|---|
| SIDE FRAME | | | | | | |
| 1 | 27.44 | 30.01 | 25.91 | 20.00 | 14.01 | |
| 2 | 25.91 | 20.00 | 24.58 | 12.25 | 21.76 | |
| 3 | 24.58 | 12.25 | 18.61 | 4.50 | 29.51 | |
| BOT FRAME | | | | | | |
| 1 | 18.61 | 4.50 | 16.46 | 3.44 | 30.57 | |
| 2 | 16.46 | 3.44 | 12.35 | 2.00 | 32.01 | |
| 3 | 12.35 | 2.00 | 8.23 | 0.99 | 33.02 | |
| 4 | 8.23 | 0.99 | 4.12 | 0.31 | 33.70 | |
| 5 | 4.12 | 0.31 | 0.00 | 0.00 | 34.01 | |

SEGMENT SCANTLINGS

SCANTLINGS OF STIFFENED PLATES

| SEG | STIFFENERS INXINXIN/IN | | | | CATLG NO | PLATE TK, IN | SPAN FT |
|---|---|---|---|---|---|---|---|
| SIDE FRAME | | | | | | | |
| 1 *F | 11.810X | 4.010X | 0.235/ | 0.350 | 35. | 0.2500 | 10.01 |
| 2 *F | 11.810X | 4.010X | 0.235/ | 0.350 | 35. | 0.2500 | 7.75 |
| 3 *F | 13.405X | 5.000X | 0.230/ | 0.335 | 40. | 0.2813 | 7.75 |
| BOT FRAME | | | | | | | |
| 1 | 6.372X | 6.372X | 0.219/ | 0.219 | | 0.3438 | 2.39 |
| 2 | 21.388X | 12.500X | 0.250/ | 0.250 | | 0.3438 | 4.36 |
| 3 | 36.058X | 12.500X | 0.250/ | 0.250 | | 0.3438 | 4.24 |
| 4 | 46.180X | 12.500X | 0.250/ | 0.250 | | 0.3438 | 4.17 |
| 5 | 52.138X | 12.500X | 0.250/ | 0.250 | | 0.3438 | 4.13 |

NOTE: *F STANDS FOR FABRICATED SHAPE

SEGMENT PROPERTIES

PROPERTIES OF STIFFENED PLATES

| SEG | AREA TOTAL IN2 | AREA SHEAR IN2 | N.A. TO PLATE IN | SEC MOD PLATE IN3 | SEC MOD FLANGE IN3 | WT/FT LBF/FT | SMEAR RATIO |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SIDE FRAME | | | | | | | |
| SEG | | | | | | | |
| 1 | 28.18 | 2.92 | 1.32 | 225.92 | 26.95 | 95.70 | 0.17 |
| 2 | 28.18 | 2.92 | 1.32 | 225.92 | 26.95 | 95.70 | 0.17 |
| 3 | 31.76 | 3.22 | 1.53 | 290.81 | 35.58 | 107.87 | 0.18 |
| BOT FRAME | | | | | | | |
| SEG | | | | | | | |
| 1 | 4.98 | 1.52 | 2.98 | 14.47 | 10.88 | 16.91 | 0.18 |
| 2 | 12.77 | 5.50 | 10.03 | 106.10 | 89.02 | 43.37 | 0.18 |
| 3 | 16.44 | 9.16 | 17.07 | 199.36 | 173.70 | 55.82 | 0.18 |
| 4 | 18.97 | 11.69 | 21.99 | 273.87 | 242.96 | 64.41 | 0.18 |
| 5 | 20.46 | 13.18 | 24.90 | 321.64 | 287.80 | 69.47 | 0.18 |

STRESS AND FACTOR OF SAFETY

| | -STRESS, KSI- | | ------FOS----- | |
|---|---|---|---|---|
| | BENDING | SHEAR | BENDING | SHEAR |
| SIDE FRAME | | | | |
| SEG | | | | |
| 1 | 36.00 | 12.38 | 1.06 | 1.84 |
| 2 | 33.53 | 14.89 | 1.13 | 1.53 |
| 3 | 34.55 | 18.26 | 1.10 | 1.25 |
| BOT FRAME | | | | |
| SEG | | | | |
| 1 | 17.43 | 12.42 | 2.18 | 1.84 |
| 2 | 7.78 | 6.54 | 4.88 | 3.48 |
| 3 | 3.95 | 3.93 | 9.63 | 5.80 |
| 4 | 2.82 | 3.10 | 13.49 | 7.36 |
| 5 | 2.36 | 2.74 | 16.09 | 8.31 |

PRINTED REPORT NO. 14 - DECK BEAMS

FRAME SPACING, FT 8.00

SEGMENT GEOMETRY

| | --------NODE COORD, FT | | | -------------------- | SCND. LOAD, FT-- | |
|---|---|---|---|---|---|---|
| SEG | YIB | ZIB | YOB | ZOB | HEAD1 | HEAD2 |
| WET DECK | | | | | | |
| SEG | | | | | | |
| 1 | 0.00 | 30.01 | 6.86 | 30.01 | 8.40 | |
| 2 | 6.86 | 30.01 | 13.72 | 30.01 | 8.40 | |
| 3 | 13.72 | 30.01 | 20.58 | 30.01 | 8.40 | |
| 4 | 20.58 | 30.01 | 27.44 | 30.01 | 8.40 | |
| DECK NO. 1 | | | | | | |
| SEG | | | | | | |
| 1 | 0.00 | 20.00 | 6.86 | 20.00 | 2.70 | |
| 2 | 6.86 | 20.00 | 13.72 | 20.00 | 2.70 | |
| 3 | 13.72 | 20.00 | 20.58 | 20.00 | 2.70 | |
| 4 | 20.58 | 20.00 | 25.91 | 20.00 | 2.81 | |
| DECK NO. 2 | | | | | | |
| SEG | | | | | | |
| 1 | 0.00 | 12.25 | 6.86 | 12.25 | 2.70 | |
| 2 | 6.86 | 12.25 | 13.72 | 12.25 | 2.70 | |
| 3 | 13.72 | 12.25 | 24.58 | 12.25 | 2.70 | |

SEGMENT SCANTLINGS

| | ----------------SCANTLINGS OF STIFFENED PLATES----------------- | | | | | | |
|---|---|---|---|---|---|---|---|
| | STIFFENERS ---------INXINXIN/IN-------------- | | | | CATLG NO | PLATE TK, IN | SPAN FT |
| WET DECK | | | | | | | |
| SEG | | | | | | | |
| 1 *R | 5.735X | 3.970X | 0.200/ | 0.225 | 5. | 0.3438 | 6.86 |
| 2 *R | 5.735X | 3.970X | 0.200/ | 0.225 | 5. | 0.3438 | 6.86 |
| 3 *R | 5.735X | 3.970X | 0.200/ | 0.225 | 5. | 0.3438 | 6.86 |
| 4 *R | 5.735X | 3.970X | 0.200/ | 0.225 | 5. | 0.3438 | 6.86 |
| DECK NO. 1 | | | | | | | |
| SEG | | | | | | | |
| 1 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 0.2188 | 6.86 |
| 2 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 0.2188 | 6.86 |
| 3 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 0.2188 | 6.86 |
| 4 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 0.2813 | 5.33 |
| DECK NO. 2 | | | | | | | |
| SEG | | | | | | | |
| 1 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 0.2188 | 6.86 |
| 2 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 0.2188 | 6.86 |
| 3 *F | 5.685X | 3.940X | 0.170/ | 0.215 | 3. | 0.2188 | 10.86 |

NOTE: *F STANDS FOR FABRICATED SHAPE
*R STANDS FOR ROLLED SHAPE

SEGMENT PROPERTIES

| | ----------------PROPERTIES OF STIFFENED PLATES------------------ | | | | | | |
|---|---|---|---|---|---|---|---|
| | ------AREA------ | | N.A. TO | -----SEC MOD----- | | | SMEAR |
| SEG | TOTAL IN2 | SHEAR IN2 | PLATE IN | PLATE IN3 | FLANGE IN3 | WT/FT LBF/FT | RATIO |
| WET DECK | | | | | | | |
| SEG | | | | | | | |
| 1 | 35.04 | 1.26 | 0.42 | 103.33 | 7.46 | 119.01 | 0.06 |
| 2 | 35.04 | 1.26 | 0.42 | 103.33 | 7.46 | 119.01 | 0.06 |
| 3 | 35.04 | 1.26 | 0.42 | 103.33 | 7.46 | 119.01 | 0.06 |
| 4 | 35.04 | 1.26 | 0.42 | 103.33 | 7.46 | 119.01 | 0.06 |
| DECK NO. 1 | | | | | | | |
| SEG | | | | | | | |
| 1 | 22.44 | 0.71 | 0.31 | 48.67 | 3.88 | 76.22 | 0.07 |
| 2 | 22.44 | 0.71 | 0.31 | 48.67 | 3.88 | 76.22 | 0.07 |
| 3 | 22.44 | 0.71 | 0.31 | 48.67 | 3.88 | 76.22 | 0.07 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 4 | 28.44 | 0.72 | 0.30 | 51.70 | 3.93 | 96.60 | 0.05 |
| DECK NO. 2 | | | | | | | |
| SEG | | | | | | | |
| 1 | 22.44 | 0.71 | 0.31 | 48.67 | 3.88 | 76.22 | 0.07 |
| 2 | 22.44 | 0.71 | 0.31 | 48.67 | 3.88 | 76.22 | 0.07 |
| 3 | 22.81 | 1.04 | 0.45 | 83.34 | 6.66 | 77.48 | 0.09 |

STRESS AND FACTOR OF SAFETY

| | -STRESS, KSI- BENDING | SHEAR | ------FOS----- BENDING | SHEAR |
|---|---|---|---|---|
| WET DECK | | | | |
| SEG | | | | |
| 1 | 35.07 | 11.76 | 1.08 | 1.94 |
| 2 | 35.07 | 11.76 | 1.08 | 1.94 |
| 3 | 35.07 | 11.76 | 1.08 | 1.94 |
| 4 | 35.07 | 11.76 | 1.08 | 1.94 |
| DECK NO. 1 | | | | |
| SEG | | | | |
| 1 | 21.90 | 6.74 | 1.74 | 3.38 |
| 2 | 21.90 | 6.74 | 1.74 | 3.38 |
| 3 | 21.90 | 6.74 | 1.74 | 3.38 |
| 4 | 13.52 | 5.36 | 2.81 | 4.25 |
| DECK NO. 2 | | | | |
| SEG | | | | |
| 1 | 21.90 | 6.74 | 1.74 | 3.38 |
| 2 | 21.90 | 6.74 | 1.74 | 3.38 |
| 3 | 31.93 | 7.27 | 1.19 | 3.14 |

PRINTED REPORT NO. 15 - LONGITUDINAL BULKHEAD VERTICAL STIFFENERS

NUMBER OF LONG BHD 0

ASSET/MONOSC VERSION 3.3+ - APPENDAGE MODULE - 2/11/95 10.47.01.

```
** WARNING - APPENDAGE MODULE ** (W-FINROTATSHIFT-FINREP)
FWD FINS HAVE BEEN RE-POSITIONED BY SHIFTING FIN ROOT
Z-COORD.    -0.74 FT (UPWARD POSITIVE) AND BY ROTATING
ABOUT FIN ROOT    10.00 DEG (CLOCKWISE POSITIVE).
** WARNING - APPENDAGE MODULE ** (W-FINSPANRESIZE-FINRES)
FWD FINS HAVE BEEN RESIZED:
    CHANGE IN CHORD              0.44 FT
    CHANGE IN THK                0.07 FT
    CHANGE IN SPAN              -0.42 FT
    CHANGE IN AREA               0.00 FT2
```

PRINTED REPORT NO. 1 - SUMMARY

| | |
|---|---|
| APPENDAGE DISP, LTON | 87.6 |
| SHELL DISP, LTON | 15.0 |
| SKEG IND | PRESENT |
| SKEG DISP, LTON | 9.9 |
| SKEG AFT LIMIT/LBP | 0.8591 |
| SKEG THK, FT | 1.00 |
| SKEG PROJECTED AREA, FT2 | 346.4 |
| BILGE KEEL IND | PRESENT |
| BILGE KEEL DISP, LTON | 5.8 |
| BILGE KEEL LGTH, FT | 89.78 |
| SHAFT SUPPORT TYPE IND | POD |
| SHAFT SUPPORT DISP, LTON | 44.6 |
| SHAFT DISP, LTON | 0.0 |
| PROP TYPE IND | FP |
| PROP BLADE DISP, LTON | 0.8 |
| NO PROP SHAFTS | 2 |
| PROP DIA, FT | 11.67 |
| SONAR DOME IND | NONE |
| SONAR DISP, LTON | 0.0 |

| | |
|---|---|
| RUDDER TYPE IND | SPADE |
| NO RUDDERS | 2 |
| AVG RUDDER CHORD, FT | 9.93 |
| RUDDER THK, FT | 1.11 |
| RUDDER SPAN, FT | 12.08 |
| RUDDER PROJECTED AREA, FT2 | 120.0 |
| RUDDER DISP, LTON | 5.1 |
| FIN SIZE IND | CALC |
| NO FIN PAIRS | 1 |
| FWD FIN | |
| CHORD, FT | 10.64 |
| THK, FT | 1.60 |
| SPAN, FT | 9.79 |
| PROJECTED AREA, FT2 | 104.2 |
| DISP, LTON (PER PAIR) | 6.3 |
| AFT FIN | |
| CHORD, FT | |
| THK, FT | |
| SPAN, FT | |
| PROJECTED AREA, FT2 | |
| DISP, LTON (PER PAIR) | |

PRINTED REPORT NO. 2 - APPENDAGE BUOYANCY AND WEIGHT

| APPENDAGE | DISP, LTON | ----CENTER OF BUOYANCY---- X, FT | Y, FT | Z, FT |
|---|---|---|---|---|
| SHELL | 15.0 | 195.70 | 0.00 | 9.65 |
| SKEG | 9.9 | 295.83 | 0.00 | 2.54 |
| BILGE KEELS* | 5.8 | 147.25 | 18.12 | 6.22 |
| PODS* | 44.6 | 354.70 | 8.30 | 3.88 |
| PROP BLADES* | 0.8 | 345.45 | 8.30 | 2.19 |
| RUDDERS* | 5.1 | 372.88 | 8.30 | 7.00 |
| ROLL FIN PAIR* | 6.3 | 209.00 | 21.80 | 0.83 |
| TOTAL, LTON | 87.6 | | | |

* TRANSVERSE C.B. PER SIDE IS SHOWN

SWBS114, SHLL APNDG, LTON 17.24 SWBS565, ROLL FINS, LTON 36.46

ASSET/MONOSC VERSION 3.3+ - RESISTANCE MODULE - 2/11/95 10.47.12.

PRINTED REPORT NO. 1 - SUMMARY

| | | | |
|---|---|---|---|
| RESID RESIST IND | NRC | BILGE KEEL IND | PRESENT |
| FRICTION LINE IND | ITTC | SHAFT SUPPORT TYPE IND | POD |
| ENDUR DISP IND | AVG DISP | PRPLN SYS RESIST IND | CALC |
| ENDUR CONFIG IND | NO TS | PROP TYPE IND | FP |
| SONAR DRAG IND | | SONAR DOME IND | NONE |
| SKEG IND | PRESENT | RUDDER TYPE IND | SPADE |
| FULL LOAD WT, LTON | 3980.1 | CORR ALW | 0.00050 |
| AVG ENDUR DISP, LTON | 3810.6 | DRAG MARGIN FAC | 0.080 |
| USABLE FUEL WT, LTON | 394.3 | TRAILSHAFT PWR FAC | |
| NO RUDDERS | 2. | | |
| NO FIN PAIRS | 1. | PRPLN SYS RESIST FRAC | |
| PROP TIP CLEAR RATIO | 0.25 | MAX SPEED | 0.186 |
| NO PROP SHAFTS | 2. | SUSTN SPEED | 0.207 |
| PROP DIA, FT | 11.67 | ENDUR SPEED | 0.408 |

| CONDITION | SPEED KT | ------------EFFECTIVE HORSEPOWER, HP------------ FRIC | RESID | APPDG | WIND | MARGIN | TOTAL | DRAG LBF |
|---|---|---|---|---|---|---|---|---|
| MAX | 26.05 | 5812. | 8365. | 4156. | 214. | 1484. | 20032. | 250565. |
| SUSTN | 25.00 | 5156. | 6074. | 3623. | 189. | 1203. | 16245. | 211746. |
| ENDUR | 14.00 | 939. | 416. | 773. | 34. | 173. | 2334. | 54319. |

PRINTED REPORT NO. 2 - SPEED-POWER MATRIX

RESID RESIST IND NRC
ENDUR DISP IND AVG DISP

SPEED AND POWER FOR FULL LOAD DISP

FULL LOAD WT, LTON 3980.1

| SPEED KT | ------------EFFECTIVE HORSEPOWER, HP------------ FRIC | RESID | APPDG | WIND | MARGIN | TOTAL | DRAG LBF |
|---|---|---|---|---|---|---|---|
| 2.00 | 3. | 0. | 7. | 0. | 1. | 12. | 1882. |
| 4.00 | 25. | 3. | 36. | 1. | 5. | 71. | 5778. |
| 6.00 | 82. | 18. | 96. | 3. | 16. | 214. | 11627. |
| 8.00 | 189. | 56. | 194. | 6. | 36. | 480. | 19565. |
| 10.00 | 360. | 136. | 338. | 12. | 68. | 914. | 29771. |
| 12.00 | 611. | 281. | 534. | 21. | 116. | 1563. | 42443. |
| 14.00 | 956. | 427. | 777. | 33. | 175. | 2369. | 55140. |
| 16.00 | 1409. | 554. | 1070. | 50. | 247. | 3329. | 67805. |
| 18.00 | 1984. | 973. | 1452. | 71. | 358. | 4838. | 87586. |
| 20.00 | 2695. | 1596. | 1914. | 97. | 504. | 6806. | 110889. |
| 22.00 | 3555. | 2478. | 2464. | 129. | 690. | 9315. | 137979. |
| 24.00 | 4578. | 4461. | 3183. | 167. | 991. | 13380. | 181674. |
| 26.00 | 5779. | 8236. | 4128. | 213. | 1468. | 19824. | 248465. |
| 28.00 | 7169. | 15862. | 5473. | 266. | 2302. | 31071. | 361607. |

SPEED AND POWER FOR AVE ENDUR DISP

AVE ENDUR DISP, LTON 3810.6

| SPEED KT | FRIC | RESID | APPDG | WIND | MARGIN | TOTAL | DRAG LBF |
|---|---|---|---|---|---|---|---|
| | ------------EFFECTIVE HORSEPOWER, HP------------ | | | | | | |
| 2.00 | 3. | 0. | 7. | 0. | 1. | 11. | 1866. |
| 4.00 | 25. | 3. | 36. | 1. | 5. | 70. | 5726. |
| 6.00 | 80. | 18. | 96. | 3. | 16. | 212. | 11518. |
| 8.00 | 185. | 55. | 194. | 6. | 35. | 476. | 19379. |
| 10.00 | 354. | 135. | 337. | 12. | 67. | 905. | 29488. |
| 12.00 | 600. | 280. | 532. | 21. | 115. | 1548. | 42042. |
| 14.00 | 939. | 416. | 773. | 34. | 173. | 2334. | 54319. |
| 16.00 | 1383. | 503. | 1061. | 50. | 240. | 3236. | 65916. |
| 18.00 | 1947. | 838. | 1433. | 72. | 343. | 4634. | 83887. |
| 20.00 | 2645. | 1377. | 1886. | 98. | 481. | 6487. | 105698. |
| 22.00 | 3489. | 2208. | 2430. | 131. | 661. | 8918. | 132099. |
| 24.00 | 4494. | 4033. | 3134. | 170. | 946. | 12777. | 173479. |
| 26.00 | 5672. | 7582. | 4058. | 216. | 1402. | 18929. | 237243. |
| 28.00 | 7036. | 15019. | 5386. | 269. | 2217. | 29927. | 348298. |

PRINTED REPORT NO. 3 - SHIP GEOMETRIC DATA FOR RESISTANCE COMPUTATIONS

RESID RESIST IND NRC
ENDUR DISP IND AVG DISP

| | FULL LOAD | AVE ENDUR DISP |
|---|---|---|
| BARE HULL DISP, LTON | 3892.6 | 3723.0 |
| APPENDAGE DISP, LTON | 87.5 | 87.5 |
| TOTAL DISP, LTON | 3980.1 | 3810.6 |
| LBP, FT | 380.00 | 380.00 |
| WL LENGTH, FT | 380.00 | 379.80 |
| BEAM AT MAX AREA STA, FT | 51.00 | 50.94 |
| DRAFT AT MAX AREA STA, FT | 15.50 | 15.08 |
| TAYLOR WETTED SURF AREA, FT2 | 19631.6 | 19344.8 |
| SHIP WETTED SURF AREA, FT2 | 19631.6 | 19344.8 |
| SKEG WETTED SURF AREA, FT2 | 692.9 | 692.9 |
| WIND FRONT AREA, FT2 | 1664.3 | 1685.6 |
| FROUDE WETTED SURF COEF | 7.2061 | 7.2858 |
| LENGTH-BEAM RATIO | 7.4510 | 7.4555 |
| BEAM-DRAFT RATIO | 3.2906 | 3.3781 |
| PRISMATIC COEF | 0.5699 | 0.5645 |
| MAX SECTION COEF | 0.7953 | 0.7905 |
| DISP-LENGTH RATIO | 70.9400 | 67.9538 |
| LCB-LENGTH RATIO | 0.5036 | 0.5007 |
| HALF ANG ENTRANCE, DEG | 8.74 | 8.54 |
| HALF ANG RUN, DEG | 5.94 | 9.65 |
| TRANSOM BUTTOCK ANG, DEG | 5.93 | 5.93 |
| BOW SECT AREA COEF | 0.0000 | 0.0000 |
| TRANSOM SECT AREA COEF | 0.0412 | 0.0219 |
| TRANSOM BREADTH COEF | 0.6135 | 0.5451 |
| TRANSOM DEPTH COEF | 0.0763 | 0.0507 |

PRINTED REPORT NO. 4 - APPENDAGE DATA

| | |
|---|---|
| SKEG IND | PRESENT |
| SKEG AREA, FT2 | 346.4 |
| BILGE KEEL IND | PRESENT |
| SHAFT SUPPORT TYPE IND | POD |
| POD STRUT CHORD LGTH, FT | 8.57 |
| POD STRUT THICKNESS, FT | 2.48 |
| POD BARREL LGTH, FT | 24.50 |
| POD BARREL DIA, FT | 7.43 |
| POD STRUT TE OFFSET, FT | 7.56 |
| NO PROP SHAFTS | 2. |
| WET SHAFT LGTH (PORT), FT | 0.00 |
| WET SHAFT LGTH (STBD), FT | 0.00 |
| INTRMDT SHAFT DIA, FT | |
| PROP TYPE IND | FP |
| PROP DIA, FT | 11.67 |
| SONAR DOME IND | NONE |
| SONAR DRAG IND | |
| SONAR SECT AREA, FT2 | |
| NO RUDDERS | 2. |
| RUDDER AREA, FT2 | 120.0 |
| NO FIN PAIRS | 1. |
| ROLL FIN AREA, FT2 | 208.4 |

ASSET/MONOSC VERSION 3.3+ - PROPELLER MODULE - 2/11/95 10.47.26.

PRINTED REPORT NO. 1 - SUMMARY

| | | | |
|---|---|---|---|
| ENDUR CONFIG IND | NO TS | | |
| PROP TYPE IND | FP | PROP SERIES IND | ANALYTIC |
| PROP DIA IND | CALC | PROP LOC IND | CALC |
| PROP AREA IND | CALC | PROP ID IND | |
| SHAFT SUPPORT TYPE IND | POD | RUDDER TYPE IND | SPADE |
| MAX SPEED, KT | 26.05 | ENDUR SPEED, KT | 14.00 |
| MAX EHP (/SHAFT), HP | 10016. | ENDUR EHP (/SHAFT), HP | 1167. |
| MAX SHP (/SHAFT), HP | 14388. | ENDUR SHP (/SHAFT), HP | 1619. |
| MAX PROP RPM | 220.0 | ENDUR PROP RPM | 110.3 |
| MAX PROP EFF | 0.696 | ENDUR PROP EFF | 0.721 |
| SUSTN SPEED, KT | 25.00 | PROP DIA, FT | 11.67 |
| SUSTN EHP (/SHAFT), HP | 8122. | NO BLADES | 7. |
| SUSTN SHP (/SHAFT), HP | 11529. | PITCH RATIO | 1.26 |
| SUSTN PROP RPM | 206.6 | EXPAND AREA RATIO | 0.905 |
| SUSTN PROP EFF | 0.705 | CAVITATION NO | 1.71 |
| NO PROP SHAFTS | 2.0 | | |
| TOTAL PROPELLER WT, LTON | 13.97 | | |

PRINTED REPORT NO. 2 - PROPELLER CHARACTERISTICS

| | |
|---|---|
| PROP ID IND | |
| NO PROP SHAFTS | 2. |
| PROP DIA, FT | 11.67 |
| NO BLADES | 7. |
| PITCH RATIO | 1.26 |
| EXPAND AREA RATIO | 0.905 |
| THRUST DED COEF | 0.050 |
| TAYLOR WAKE FRAC | 0.050 |
| HULL EFFICIENCY | 1.000 |
| REL ROTATE EFF | 1.000 |

| CHARACTERISTICS | CONDITIONS MAXIMUM | SUSTAINED | ENDURANCE |
|---|---|---|---|
| SPEED, KT | 26.05 | 25.00 | 14.00 |
| RPM | 220.0 | 206.6 | 110.3 |
| THRUST/SHAFT, LBF | 131878. | 111446. | 28589. |
| EHP/SHAFT, HP | 10016. | 8122. | 1167. |
| TORQUE/SHAFT, FT-LBF | 343480. | 293081. | 77103. |
| SHP/SHAFT, HP | 14388. | 11529. | 1619. |
| ADVANCE COEF (J) | 0.976 | 0.997 | 1.046 |
| THRUST COEF (KT) | 0.265 | 0.254 | 0.229 |
| TORQUE COEF (10KQ) | 0.592 | 0.573 | 0.529 |
| OPEN WATER EFFY | 0.696 | 0.705 | 0.721 |
| PC | 0.696 | 0.705 | 0.721 |

PRINTED REPORT NO. 3 - CAVITATION CHARACTERISTICS

| | |
|---|---|
| MAX SPEED OF ADV, KT | 24.75 |
| MAX THRUST, LBF | 131878. |
| MAX PROP RPM | 220.0 |
| PROP DIA, FT | 11.67 |
| HUB DEPTH, FT | 13.31 |
| STD CAV NO | 1.71 |
| LOCAL CAV NO (.7R) | 0.28 |
| MEAN THRUST LOADING COEF | 0.17 |
| EXPAND AREA RATIO | 0.905 |
| MIN EAR REQUIRED | 0.905 |
| BACK CAV ALLOWED, PERCENT | 10.0 |

PRINTED REPORT NO. 4 - PROPELLER ARRANGEMENT

| | |
|---|---|
| PROP DIA, FT | 11.67 |
| FULL LOAD DRAFT, FT | 15.50 |
| HUB DEPTH FROM DWL, FT | 13.31 |
| LONG LOC FROM AP, FT | 34.55 |
| HUB POS FROM CL, FT | 8.30 |
| TIP CLR FROM BL, FT | -3.65 |
| TIP CLR FROM MAX HB, FT | 13.30 |
| TIP CLR FROM HULL BOT, FT | 2.77 |
| TOTAL PROPELLER WT, LTON | 13.97 |

ASSET/MONOSC VERSION 3.3+ - MACHINERY MODULE - 2/11/95 10.47.57.

```
** WARNING - MACHINERY MODULE ** (W-TORQGOVRNSHDIA-SHSIZN)
PROPELLER SHAFT DIAMETER IS GOVERNED BY TORQUE.
** WARNING - MACHINERY MODULE ** (W-MRDIM2SMALL-MRDIMR)
DIMENSIONS OF THE FOLLOWING MACHINERY ROOMS ARE TOO SMALL
TO ENCLOSE MACHINERY : 2
** WARNING - MACHINERY MODULE ** (W-LT1ENGPERSHAFTE-MHYMSG)
LESS THAN ONE PROPULSION ENGINE PER PROPELLER SHAFT IS OPERATING
AT ENDURANCE (DUE TO SELECTION OF VALUES WITHIN THE  PARAMETER
ELECT PG ARR OP ARRAY). THIS IS NOT CURRENT STANDARD NAVAL PRACTICE.
** WARNING - MACHINERY MODULE ** (W-TOTALSSGENLT3-MHYMSG)
TOTAL NUMBER OF SHIP SERVICE GENERATORS (INCLUDING VSCF, IF ANY),
IS LESS THAN THREE.
** WARNING - MACHINERY MODULE ** (W-ZEROSBYSSGEN-MHYMSG)
NO STANDBY SHIP-SERVICE GENERATORS EXIST AT BATTLE ELECTRICAL
LOADING CONDITION.
** WARNING - MACHINERY MODULE ** (W-OPSSGENENDURLT2-MHYMSG)
NUMBER OF SHIP SERVICE GENERATORS OPERATING AT ENDURANCE CONDITION IS
LESS THAN TWO.
```

PRINTED REPORT NO. 1 - SUMMARY

| | | | |
|---|---|---|---|
| TRANS TYPE IND | ELECT | MAX SPEED, KT | 26.05 |

| | | | |
|---|---|---|---|
| ELECT PRPLN TYPE IND | ACR-DCS | SUSTN SPEED IND | GIVEN |
| SHAFT SUPPORT TYPE IND | POD | SUSTN SPEED, KT | 25.00 |
| NO PROP SHAFTS | 2. | ENDUR SPEED IND | GIVEN |
| ENDUR CONFIG IND | NO TS | ENDUR SPEED, KT | 14.00 |
| SEC ENG USAGE IND | | DESIGN MODE IND | ENDURANCE |
| MAX MARG ELECT LOAD, KW | 2755. | ENDURANCE, NM | 6000. |
| AVG 24 HR ELECT LOAD, KW | 1142. | USABLE FUEL WT, LTON | 394.3 |
| SWBS 200 GROUP WT, LTON | 281.3 | SUSTN SPEED POWER FRAC | 0.80 |
| SWBS 300 GROUP WT, LTON | 261.7 | | |

| ARRANGEMENT OR SS GEN | TYPE | NO INSTALLED | NO ONLINE MAX+SUSTN | NO ONLINE ENDURANCE |
|---|---|---|---|---|
| ELECT PG ARR 1 IND | M-PG | 2 | 2 | 1 |
| ELECT PG ARR 2 IND | | 0 | 0 | 0 |
| ELECT DL ARR IND | MTR | 2 | 2 | 2 |
| SEP SS GEN | 2868. KW | 2 | 2 | 1 |
| VSCF SS CYCLO | KW | 0 | 0 | 0 |

| | MAIN ENG | SEC ENG | SS ENG |
|---|---|---|---|
| ENG SELECT IND | GIVEN | | GIVEN |
| ENG MODEL IND | GE-LM1600-VAN2 | | A-12V270 |
| ENG TYPE IND | RGT | | D DIESEL |
| ENG SIZE IND | CALC | | CALC |
| NO INSTALLED | 2 | 0 | 2 |
| ENG PWR AVAIL, HP | 15902. | | 4002. |
| ENG RPM | 4522.4 | | 900.0 |
| ENG SFC, LBM/HP-HR | 0.345 | | .336 |
| ENG LOAD FRAC | 1.000 | | 1.000 |

PRINTED REPORT NO. 2 - MACHINERY EQUIPMENT LIST

| NO EACH | ITEM | WEIGHT LTON | LENGTH FT | WIDTH FT | HEIGHT FT |
|---|---|---|---|---|---|
| | PROPULSION PLANT | | | | |
| 2 | MAIN ENGINE (BARE) | 1.6 | 9.55 | 4.46 | 4.46 |
| 2 | MAIN ENGINE ENCLOSURE MODULE | 8.1 | 18.91 | 7.96 | 7.26 |
| 2 | MAIN ENGINE INTERCOOLER | 2.1 | 4.48 | 5.05 | 5.05 |
| 0 | SEC ENGINE (BARE) | | | | |
| 0 | SEC ENGINE ENCLOSURE MODULE | | | | |
| 0 | SEC ENGINE INTERCOOLER | | | | |
| 0 | RACER STEAM TURBINE | | | | |
| 0 | RACER CONDENSER | | | | |
| 0 | LTDR GEAR (01) | | | | |
| 0 | EPIC REV PINION GEAR (02) | | | | |
| 0 | FRANCO TOSI REV GEAR (03) | | | | |
| 0 | VSCF COMB/STEP-UP GEAR (04) | | | | |
| 0 | RACER REDUCTION GEAR (05) | | | | |
| 0 | 2 SPD SOLAR EPIC GEAR (06) | | | | |
| 0 | OFFSET GEAR (07) | | | | |
| 0 | OFFSET COMB (2-1) GEAR (08) | | | | |
| 0 | OFFSET COMB (3-2) GEAR (09) | | | | |
| 0 | CR EPIC GEAR (10) | | | | |
| 0 | Z DRIVE SPIRAL BVL GEAR (11) | | | | |
| 0 | PLANETARY REDUCTION GEAR(12) | | | | |
| 0 | CR BI-COUPLED EPIC GEAR (13) | | | | |
| 0 | STAR EPIC REV GEAR (14) | | | | |
| 0 | STAR EPIC REDUCTION GEAR(15) | | | | |
| 0 | COMBINING STEP-UP GEAR (16) | | | | |
| 2 | PROPULSION GENERATOR | 13.7 | 13.60 | 5.42 | 5.42 |
| 2 | PROPULSION MOTOR | 14.4 | 8.58 | 4.49 | 4.49 |
| 2 | THRUST BEARING | 3.0 | 2.45 | 3.42 | 3.42 |
| 2 | PROPELLER SHAFT | | | | |
| | ELECTRIC PLANT | | | | |
| 2 | SS ENGINE (BARE) | 22.4 | 16.64 | 6.34 | 8.01 |
| 0 | SS ENGINE ENCLOSURE MODULE | | | | |
| 0 | SS REDUCTION GEAR (17) | | | | |
| 2 | SEPARATE SS GENERATOR | 12.5 | 7.14 | 5.09 | 6.59 |
| 0 | VSCF SS GENERATOR | | | | |
| 0 | VSCF SS CYCLOCONVERTER | | | | |

PRINTED REPORT NO. 3 - ENGINES

| | MAIN ENG | SEC ENG | SS ENG |
|---|---|---|---|
| ENG SELECT IND | GIVEN | | GIVEN |
| ENG TYPE IND | RGT | | D DIESEL |
| ENG MODEL IND | GE-LM1600-VAN2 | | A-12V270 |
| ENG SIZE IND | CALC | | CALC |
| NO INSTALLED | 2 | 0 | 2 |
| ENG BARE WT, LTON | 1.6 | | 22.4 |
| ENG LENGTH, FT | 9.55 | | 16.64 |
| ENG WIDTH, FT | 4.46 | | 6.34 |
| ENG HEIGHT, FT | 4.46 | | 8.01 |
| ENG PWR AVAIL, HP | 15902. | | 4002.1 |
| ENG RPM | 4522.4 | | 900.0 |
| ENG MASS FL, LBM/SEC | 74.2 | | 13.7 |
| ENG EXH TEMP, DEGF | 676.6 | | 818.9 |
| ENG SFC EQN IND | POLY QN | | DIESEL |
| ENG SFC, LBM/HP-HR | 0.345 | | .336 |
| MAX SPEED CONDITION | | | |
| NO OPERATING | 2 | 0 | 2 |
| ENG PWR, HP | 15902. | | 1922.2 |
| ENG RPM | 4522.4 | | 900.0 |
| ENG MASS FL, LBM/SEC | 74.2 | | 10.3 |
| ENG EXH TEMP, DEGF | 676.6 | | 677.6 |
| ENG SFC, LBM/HP-HR | .345 | | .337 |
| SUSTN SPEED CONDITION | | | |
| NO OPERATING | 2 | 0 | 2 |
| ENG PWR, HP | 12721. | | 1922.2 |
| ENG RPM | 4247.1 | | 900.0 |
| ENG MASS FL, LBM/SEC | 68.1 | | 10.3 |
| ENG EXH TEMP, DEGF | 620.4 | | 677.6 |
| ENG SFC, LBM/HP-HR | .334 | | .337 |
| ENDUR SPEED CONDITION | | | |
| ENG ENDUR RPM IND | CALC | | |
| NO OPERATING | 1 | 0 | 1 |
| ENG PWR, HP | 3897. | | 1593.5 |
| ENG RPM | 4522.4 | | 900.0 |
| ENG MASS FL, LBM/SEC | 43.2 | | 9.6 |
| ENG EXH TEMP, DEGF | 497.9 | | 658.5 |
| ENG SFC, LBM/HP-HR | .342 | | .343 |

NOTE - ENGINE OPERATING DATA ARE BASED ON USE OF DFM FUEL.

PRINTED REPORT NO. 4 - GEARS

| NO EACH | ITEM | WEIGHT LTON | LENGTH FT | WIDTH FT | HEIGHT FT |
|---|---|---|---|---|---|
| | 2-STAGE REDUCTION GEARS | | | | |
| 0 | LTDR GEAR (01) | | | | |
| 0 | CR BI-COUPLED EPIC GEAR (13) | | | | |
| | 1ST STAGE REDUCTION GEARS | | | | |
| 0 | OFFSET GEAR (07) | | | | |
| 0 | OFFSET COMB (2-1) GEAR (08) | | | | |
| 0 | OFFSET COMB (3-2) GEAR (09) | | | | |
| 0 | STAR EPIC REDUCTION GEAR(15) | | | | |
| | 2ND STAGE REDUCTION GEARS | | | | |
| 0 | CR EPIC GEAR (10) | | | | |
| 0 | PLANETARY REDUCTION GEAR(12) | | | | |
| | SPECIAL GEARS | | | | |
| 0 | EPIC REV PINION GEAR (02) | | | | |
| 0 | FRANCO TOSI REV GEAR (03) | | | | |
| 0 | VSCF COMB/STEP-UP GEAR (04) | | | | |
| 0 | RACER REDUCTION GEAR (05) | | | | |
| 0 | 2 SPD SOLAR EPIC GEAR (06) | | | | |
| 0 | Z DRIVE SPIRAL BVL GEAR (11) | | | | |
| 0 | STAR EPIC REV GEAR (14) | | | | |
| 0 | COMBINING STEP-UP GEAR (16) | | | | |
| 0 | SS REDUCTION GEAR (17) | | | | |

| REDUCTION GEAR DESIGN FACTORS AND DIMENSIONS | 1ST STAGE | 2ND STAGE | SS |
|---|---|---|---|
| REDUCTION RATIO | | | |

K FACTOR
FACE WIDTH RATIO
CASING WT FACTOR

GEAR FACE WIDTH, FT
PINION GEAR DIA, FT
REDUCTION GEAR DIA, FT
SUN GEAR DIA, FT
PLANET GEAR DIA, FT
RING GEAR DIA, FT
RING GEAR THK, FT
NO PLANETS

PRINTED REPORT NO. 5 - ELECTRIC PROPULSION AND VSCF EQUIPMENT

TRANS TYPE IND-ELECT
ELECT PRPLN TYPE IND-ACR-DCS
SWITCHGEAR TYPE IND-ADV
TRANS LINE NODE PT IND-CALC
ELECT PRPLN RATING IND-CALC

| | |
|---|---|
| TRANS LINE NODE PT X, FT | 258.20 |
| TRANS LINE NODE PT Y, FT | -6.17 |
| TRANS LINE NODE PT Z, FT | 15.00 |

MOTORS AND GENERATORS

| | PRPLN GENERATOR | PRPLN MOTOR | VSCF GENERATOR |
|---|---|---|---|
| INSTALLED NUMBER | 2 | 2 | 0 |
| TYPE | AC | DCS | |
| FREQUENCY CONTROL | NO | | |
| DRIVE | | DIRECT | |
| ROTOR COOLING | AIR | LIQUID | |
| ROTOR TIP SPEED, FT/MIN | 28500. | | |
| STATOR COOLING | LIQUID | LIQUID | |
| ARM ELECT LOAD, AMP/IN | 2400. | | |
| POWER RATING, MW | 14.94 | 10.73 | |
| ROTATIONAL SPEED, RPM | 4522. | 220. | |
| NUMBER OF POLES | 4. | 6. | |
| LENGTH, FT | 13.6 | 8.6 | |
| WIDTH, FT | 5.4 | 4.5 | |
| HEIGHT, FT | 5.4 | 4.5 | |
| WEIGHT, LTON | 13.7 | 14.4 | |

OTHER ELECTRIC PROPULSION AND VSCF EQUIPMENT

| | WEIGHT LTON |
|---|---|
| CONTROLS | 1.4 |
| BRAKING RESISTORS | 2.1 |
| EXCITERS | 7.4 |
| SWITCHGEAR | 1.5 |
| POWER CONVERTERS | .0 |
| DEIONIZED COOL WATER SYS | 13.4 |
| PRPLN TRANS LINE | 36.9 |
| RECTIFIERS | 3.8 |
| HELIUM REFRIGERATION SYS | 4.6 |
| VSCF CYCLOCONVERTERS | .0 |

PRINTED REPORT NO. 6 - SHIP SERVICE GENERATORS

SS SYS TYPE IND-SEP
GEN SIZE IND-NON STD

| | |
|---|---|
| ELECT LOAD DES MARGIN FAC | 0.200 |
| ELECT LOAD SL MARGIN FAC | 0.100 |
| ELECT LOAD IMBAL FAC | 0.900 |
| MAX MARG ELECT LOAD, KW | 2754.9 |
| MAX STANDBY LOAD, KW | 1627.5 |
| 24 HR AVG ELECT LOAD, KW | 1141.9 |

VSCF SS CYCLOCONVERTERS

| CONDITION | NO INSTALL | NO ONLINE | REQ KW/CYCLO | AVAIL KW/CYCLO | LOADING FRAC |
|---|---|---|---|---|---|
| WINTER BATTLE | 0 | 0 | | | 0.000 |
| WINTER CRUISE | 0 | 0 | | | 0.000 |
| SUMMER CRUISE | 0 | 0 | | | 0.000 |
| ENDURANCE(24 HR AVG) | 0 | 0 | | | 0.000 |

SEPARATE SS GENERATORS

| CONDITION | NO INSTALL | NO ONLINE | REQ KW/GEN | AVAIL KW/GEN | LOADING FRAC |
|---|---|---|---|---|---|
| WINTER BATTLE | 2 | 2 | 1377. | 2868. | 0.480 |
| WINTER CRUISE | 2 | 1 | 2581. | 2868. | 0.900 |
| SUMMER CRUISE | 2 | 1 | 1899. | 2868. | 0.662 |
| ENDURANCE(24 HR AVG) | 2 | 1 | 1142. | 2868. | 0.398 |

TOTALS

| CONDITION | REQ KW | AVAIL KW | LOADING FRAC |
|---|---|---|---|
| WINTER BATTLE | 2755. | 5736. | 0.480 |
| WINTER CRUISE | 2581. | 2868. | 0.900 |
| SUMMER CRUISE | 1899. | 2868. | 0.662 |
| ENDURANCE(24 HR AVG) | 1142. | 2868. | 0.398 |

PRINTED REPORT NO. 7 - INTAKE DUCTS

INLET TYPE IND-PLENUM
DUCT SILENCING IND-BOTH
GT ENG ENCL IND-84 DBA

| | MAIN ENG | SEC ENG | SS ENG |
|---|---|---|---|
| ENG TYPE | RGT | | D DIESEL |
| INLET DUCT XSECT AREA,FT2 | 54.5 | .0 | .0 |
| INLET DUCT XSECT LTH, FT | 6.85 | .0 | .0 |
| INLET DUCT XSECT WID, FT | 7.96 | .0 | .0 |

MMR1

| | ----MAIN ENG----- | | -----SEC ENG----- | |
|---|---|---|---|---|
| | WT,LTON | VCG,FT | WT,LTON | VCG,FT |
| INLET | 0.5 | 37.05 | | |
| INLET DUCTING | 0.8 | 29.84 | | |
| INLET SILENCER | 1.1 | 35.67 | | |
| GT COOLING SUPPLY | 0.8 | 24.64 | | |
| GT BLEED AIR SUPPLY | 2.1 | 21.77 | | |

MMR2

| | MAIN ENG WT,LTON | MAIN ENG VCG,FT | SEC ENG WT,LTON | SEC ENG VCG,FT |
|---|---|---|---|---|
| INLET | 0.5 | 35.28 | | |
| INLET DUCTING | 0.7 | 28.95 | | |
| INLET SILENCER | 1.1 | 35.67 | | |
| GT COOLING SUPPLY | 0.7 | 23.98 | | |
| GT BLEED AIR SUPPLY | 2.1 | 21.31 | | |

NOTE - NUMERIC DATA PRESENTED ABOVE ARE ON A PER ENGINE BASIS.

TRUNK AREA AND VOLUME REQUIREMENTS

| ENGINE CATEGORY | AREA,FT2 HULL | AREA,FT2 DKHS | VOLUME,FT3 HULL | VOLUME,FT3 DKHS |
|---|---|---|---|---|
| MAIN ENGINES | 138.6 | 138.6 | 1386. | 1383. |
| SECONDARY ENGINES | 0.0 | 0.0 | 0. | 0. |
| SHIP-SERVICE ENGINES | 0.0 | 0.0 | 0. | 0. |
| TOTALS | 138.6 | 138.6 | 1386. | 1383. |

PRINTED REPORT NO. 8 - EXHAUST DUCTS

EXHAUST IR SUPPRESS IND-PRESENT
DUCT SILENCING IND-BOTH GT ENG ENCL IND-84 DBA

EXHAUST STACK TEMP, DEGF 350.0 EDUCTOR DESIGN FAC 1.000

| | MAIN ENG | SEC ENG | SS ENG |
|---|---|---|---|
| ENG TYPE | RGT | | D DIESEL |
| ENG EXH TEMP, DEG | 677. | | 819. |
| ENG MASS FL, LBM/SEC | 74.2 | | 13.7 |
| EXH DUCT GAS TEMP, DEG | 609. | | 819. |
| EXH DUCT GAS DEN, LBM/FT3 | 0.0366 | | .0306 |
| EXH DUCT MASS FL, LBM/SEC | 84.6 | | 13.7 |
| EXH DUCT AREA, FT2 | 21.5 | | 4.2 |

MMR1

| | MAIN ENG WT,LTON | MAIN ENG VCG,FT | SEC ENG WT,LTON | SEC ENG VCG,FT |
|---|---|---|---|---|
| EXH DUCT (TO BOILER/REG) | | | | |
| EXH BOILER (RACER) | | | | |
| EXH REGENERATOR | 11.5 | 22.42 | | |
| EXH DUCT (TO STACK) | 1.9 | 33.63 | | |
| EXH SILENCER | 3.1 | 38.56 | | |
| EXH STACK | 1.1 | 47.35 | | |
| EXH SPRAY RING | .6 | 32.45 | | |
| EXH EDUCTOR | 1.7 | 45.91 | | |

MMR2

| | MAIN ENG WT,LTON | MAIN ENG VCG,FT | SEC ENG WT,LTON | SEC ENG VCG,FT |
|---|---|---|---|---|
| EXH DUCT (TO BOILER/REG) | | | | |
| EXH BOILER (RACER) | | | | |
| EXH REGENERATOR | 11.5 | 22.42 | | |
| EXH DUCT (TO STACK) | 1.7 | 32.75 | | |
| EXH SILENCER | 3.1 | 38.56 | | |
| EXH STACK | 1.1 | 45.58 | | |
| EXH SPRAY RING | .6 | 31.27 | | |
| EXH EDUCTOR | 1.7 | 44.14 | | |

NOTE - NUMERIC DATA PRESENTED ABOVE ARE ON A PER ENGINE BASIS.

TRUNK AREA AND VOLUME REQUIREMENTS

| ENGINE CATEGORY | -----AREA,FT2---- HULL | DKHS | ---VOLUME,FT3---- HULL | DKHS |
|---|---|---|---|---|
| MAIN ENGINES | 342.6 | 182.1 | 3426. | 1817. |
| SECONDARY ENGINES | 0.0 | 0.0 | 0. | 0. |
| SHIP-SERVICE ENGINES | 69.6 | 69.6 | 696. | 693. |
| TOTALS | 412.3 | 251.8 | 4123. | 2510. |

PRINTED REPORT NO. 9 - PROPELLERS AND SHAFTS

SHAFT SUPPORT TYPE IND-POD
SHAFT SYS SIZE IND-CALC
PROP TYPE IND-FP

| | |
|---|---|
| PROP DIA, FT | 11.67 |
| HUB DIA, FT | 4.91 |
| PROP BLADE WT, LTON | 3.2 |
| PROP HUB WT, LTON | 3.8 |
| BEND STRESS CON FAC | 1.000 |
| OVRHG PROP MOM ARM RATIO | 0.340 |
| EQUIV FP PROP WT, LTON | 7.0 |
| ALLOW BEND STRESS, LBF/IN2 | 6000. |
| FATIGUE LIMIT, LBF/IN2 | 47500. |
| YIELD POINT, LBF/IN2 | 75000. |
| TORQUE MARGIN FAC | 1.200 |
| OFF-CENTER THRUST FAC | 1.000 |
| NO STRUTS PER SHAFT | 0 |

PORT SHAFT

| | PROP SECTION | INTERMED SECTION | LINE SECTION |
|---|---|---|---|
| ANGLE, DEG | -5.81 | | |
| LENGTH, FT | 2.92 | | |
| DIAMETER, FT | 1.22 | | |
| BORE RATIO | .550 | | |
| WEIGHT, LTON | .7 | | |
| LCG, FT | 348.06 | | |
| TCG, FT | -8.30 | | |
| VCG, FT | 2.45 | | |
| FACTOR OF SAFETY | | | |

STBD SHAFT

| | PROP SECTION | INTERMED SECTION | LINE SECTION |
|---|---|---|---|
| ANGLE, DEG | -5.81 | | |
| LENGTH, FT | 2.92 | | |
| DIAMETER, FT | 1.22 | | |
| BORE RATIO | .550 | | |
| WEIGHT, LTON | .7 | | |
| LCG, FT | 348.06 | | |
| TCG, FT | 8.30 | | |
| VCG, FT | 2.45 | | |
| FACTOR OF SAFETY | | | |

PRINTED REPORT NO. 10 - STRUTS, PODS, AND RUDDERS

SHAFT SUPPORT TYPE IND-POD
SHAFT SYS SIZE IND-CALC

| | |
|---|---|
| PROP DIA, FT | 11.67 |
| NO STRUTS PER SHAFT | 0 |
| NO SHAFTS | 2 |
| OVRHG PROP MOM ARM RATIO | 0.340 |

PODS

| | |
|---|---|
| STRUT WALL THICKNESS, FT | .05 |
| STRUT CHORD, FT | 8.57 |
| STRUT THICKNESS, FT | 2.48 |
| BARREL LTH, FT | 24.50 |
| BARREL DIA, FT | 7.43 |

RUDDERS

RUDDER TYPE IND-SPADE
RUDDER SIZE IND-CALC

| | |
|---|---|
| NO RUDDERS | 2. |
| RUDDER WT (PER), LTON | 13.7 |
| RUDDER DISP (PER), LTON | 2.5 |

| | CHORD,FT | THICK,FT | SPAN,FT |
|---|---|---|---|
| SPADE RUDDER | 9.93 | 1.11 | 12.08 |

PRINTED REPORT NO. 11 - ELECTRIC LOADS

400 HZ ELECT LOAD FAC 0.200

| PAYLOAD LOADS | WINTER CRUISE KW | WINTER BATTLE KW | SUMMER CRUISE KW |
|---|---|---|---|
| COMMAND AND SURVEILLANCE (60 HZ) | 106.9 | 464.8 | 106.9 |
| COMMAND AND SURVEILLANCE (400 HZ) | 26.7 | 116.2 | 26.7 |
| ARMAMENT (60 HZ) | 35.2 | 122.4 | 39.2 |
| ARMAMENT (400 HZ) | 8.8 | 30.6 | 9.8 |
| OTHER PAYLOAD (60 HZ) | 0.0 | 0.0 | 0.0 |
| OTHER PAYLOAD (400 HZ) | 0.0 | 0.0 | 0.0 |
| SUB-TOTAL | 177.6 | 734.0 | 182.6 |
| NON-PAYLOAD LOADS (* INDICATES USER ADJUSTED VALUE) | | | |
| PROPULSION AND STEERING | 262.6 | 291.8 | 198.7 |
| LIGHTING | 102.4 | 100.3 | 102.4 |
| MISCELLANEOUS ELECTRIC | 46.1 | 40.1 | 46.1 |
| HEATING | 605.3 | 308.7 | 30.3 |
| VENTILATION | 245.2 | 188.8 | 245.2 |
| AIR CONDITIONING | 225.4 | 211.8 | 336.4 |
| AUXILIARY BOILER AND FRESH WATER | 114.7 | 84.9 | 114.7 |
| FIREMAIN | 49.9 | 70.3 | 49.9 |
| UNREP AND HANDLING | 7.8 | 12.9* | 7.8 |
| MISC AUXILIARY MACHINERY | 99.8 | 55.9 | 99.8 |
| SERVICES AND WORK SPACES | 42.7 | 14.1 | 42.7 |
| SUBTOTAL | 1801.7 | 1379.6 | 1273.8 |
| TOTAL | 1979.3 | 2113.6 | 1456.4 |
| TOTAL (INCLUDING MARGINS) | 2581.2 | 2754.9 | 1898.6 |

| | |
|---|---|
| MAX MARG ELECT LOAD | 2754.9 |
| 24 HR AVG ELECT LOAD | 1141.9 |
| CONNECTED ELECT LOAD | 5601.1 |
| ANCHOR ELECT LOAD | 1627.5 |
| VITAL ELECT LOAD | 1049.4 |
| EMERGENCY ELECT LOAD | 675.8 |
| MAX STBY ELECT LOAD | 1627.5 |

PRINTED REPORT NO. 12 - POWERING

SUSTN SPEED IND-GIVEN
ENDUR SPEED IND-GIVEN
TRANS EFF IND-CALC

| | |
|---|---|
| 100 PCT POWER TRANS EFF | 0.9048 |
| 25 PCT POWER TRANS EFF | 0.9141 |

| | MAX SPEED | SUSTN SPEED | ENDUR SPEED |
|---|---|---|---|
| SHIP SPEED, KT | 26.05 | 25.00 | 14.00 |
| PROP RPM | 220.0 | 206.6 | 110.3 |
| NO OP PROP SHAFTS | 2 | 2 | 2 |
| EHP (/SHAFT), HP | 10016. | 8122. | 1167. |
| PROPULSIVE COEF | 0.696 | 0.705 | 0.721 |
| ENDUR PWR ALW | 1.0 | 1.0 | 1.1 |
| SHP (/SHAFT), HP | 14387. | 11529. | 1781. |
| TRANS EFFY | 0.905 | 0.906 | 0.914 |
| CP PROP TRANS EFFY MULT | 1.000 | 1.000 | 1.000 |
| PROPUL PWR (/SHAFT), HP | 15902. | 12721. | 1948. |
| PD GEN PWR (/SHAFT), HP | 0. | 0. | 0. |
| BHP (/SHAFT), HP | 15902. | 12721. | 1948. |

PRINTED REPORT NO. 13 - HULL STRUCTURE AND MISCELLANEOUS WEIGHT

| SWBS | COMPONENT | WT,LTON | LCG,FT | VCG,FT |
|---|---|---|---|---|
| 160 | SPECIAL STRUCTURES | | | |
| 161 | CASTINGS, FORGINGS, AND WELDMENTS | 33.1 | 268.42 | 9.19 |
| 162 | STACKS AND MASTS | 2.1 | 202.03 | 46.46 |
| 180 | FOUNDATIONS | | | |
| 182 | PROPULSION PLANT FOUNDATIONS | 93.2 | 249.31 | 7.48 |
| 183 | ELECTRIC PLANT FOUNDATIONS | 45.8 | 194.49 | 12.82 |

* DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS

PRINTED REPORT NO. 14 - PROPULSION PLANT WEIGHT

| SWBS | COMPONENT | WT,LTON | LCG,FT | VCG,FT |
|---|---|---|---|---|
| 200 | PROPULSION PLANT | 281.3 | 246.35 | 13.45 |
| 210 | ENERGY GENERATING SYSTEM (NUCLEAR) | 0.0 | 0.00 | 0.00 |
| 220 | ENERGY GENERATING SYSTEM (NON-NUCLEAR) | 0.0 | 0.00 | 0.00 |
| 230 | PROPULSION UNITS | 186.8 | 253.04 | 12.19 |
| 233 | PROPULSION INTERNAL COMBUSTION ENGINES | 0.0 | 0.00 | 0.00 |
| 234 | PROPULSION GAS TURBINES | 60.8 | 195.96 | 17.38 |
| 235 | ELECTRIC PROPULSION | 126.0 | 280.58 | 9.68 |
| 240 | TRANSMISSION AND PROPULSOR SYSTEMS | 21.7 | 347.13 | 2.36 |
| 241 | PROPULSION REDUCTION GEARS | 0.0 | 0.00 | 0.00 |
| 242 | PROPULSION CLUTCHES AND COUPLINGS | 0.0 | 0.00 | 0.00 |
| 243 | PROPULSION SHAFTING | 1.4 | 348.06 | 2.45 |
| 244 | PROPULSION SHAFT BEARINGS | 6.3 | 350.62 | 2.71 |
| 245 | PROPULSORS | 14.0 | 345.45 | 2.19 |
| 250 | PRPLN SUPPORT SYS (EXCEPT FUEL+LUBE OIL) | 36.6 | 198.61 | 28.42 |
| 251 | COMBUSTION AIR SYSTEM | 10.5 | 187.34 | 27.43 |
| 252 | PROPULSION CONTROL SYSTEM | 9.4 | 195.96 | 19.50 |
| 256 | CIRCULATING AND COOLING SEA WATER SYSTEM | 2.6 | 239.40 | 10.80 |
| 259 | UPTAKES (INNER CASING) | 14.2 | 201.28 | 38.18 |
| 260 | PRPLN SUPPORT SYS (FUEL+LUBE OIL) | 23.7 | 187.73 | 12.44 |
| 261 | FUEL SERVICE SYSTEM | 9.4 | 176.96 | 11.38 |
| 262 | MAIN PROPULSION LUBE OIL SYSTEM | 10.2 | 195.96 | 12.00 |
| 264 | LUBE OIL FILL, TRANSFER, AND PURIF | 4.1 | 191.96 | 16.00 |
| 290 | SPECIAL PURPOSE SYSTEMS | 12.5 | 222.19 | 9.55 |
| 298 | OPERATING FLUIDS | 9.3 | 228.00 | 8.00 |
| 299 | REPAIR PARTS AND SPECIAL TOOLS | 3.2 | 205.20 | 14.10 |

* DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS

PRINTED REPORT NO. 15 - ELECTRIC PLANT WEIGHT

| SWBS | COMPONENT | WT,LTON | LCG,FT | VCG,FT |
|---|---|---|---|---|
| 300 | ELECTRIC PLANT | 261.7 | 198.72 | 16.88 |
| 310 | ELECTRIC POWER GENERATION | 129.3 | 194.06 | 12.16 |
| 311 | SHIP SERVICE POWER GENERATION | 94.1 | 196.20 | 12.00 |
| 313 | BATTERIES AND SERVICE FACILITIES | 24.1 | 196.20 | 6.00 |
| 314 | POWER CONVERSION EQUIPMENT | 11.0 | 171.00 | 27.00 |
| 320 | POWER DISTRIBUTION SYSTEMS | 55.6 | 204.23 | 24.76 |
| 321 | SHIP SERVICE POWER CABLE | 34.9 | 201.40 | 27.00 |
| 324 | SWITCHGEAR AND PANELS | 20.7 | 209.00 | 21.00 |
| 330 | LIGHTING SYSTEM | 18.8 | 199.99 | 27.22 |
| 331 | LIGHTING DISTRIBUTION | 11.8 | 201.40 | 27.00 |
| 332 | LIGHTING FIXTURES | 7.0 | 197.60 | 27.60 |
| 340 | POWER GENERATION SUPPORT SYSTEMS | 39.2 | 194.38 | 17.56 |
| 342 | DIESEL SUPPORT SYSTEMS | 39.2 | 194.38 | 17.56 |
| 343 | TURBINE SUPPORT SYSTEMS | 0.0 | 0.00 | 0.00 |
| 390 | SPECIAL PURPOSE SYSTEMS | 18.8 | 222.20 | 14.25 |
| 398 | OPERATING FLUIDS | 14.1 | 196.20 | 12.00 |
| 399 | REPAIR PARTS AND SPECIAL TOOLS | 4.7 | 300.20 | 21.00 |

* DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS

PRINTED REPORT NO. 16 - MACHINERY ROOMS

| | |
|---|---|
| NO MAIN MACHINERY ROOMS | 2 |
| NO AUX MACHINERY ROOMS | 0 |
| NO OTHER MACHINERY ROOMS | 0 |

BULKHEAD LOCATIONS

| MR NO | MR ID | FWD BHD: BHD NO | FWD BHD: X, FT | FWD BHD: X/LBP | AFT BHD: BHD NO | AFT BHD: X, FT | AFT BHD: X/LBP |
|---|---|---|---|---|---|---|---|
| 1 | MMR1 | 6. | 136.45 | 0.359 | 7. | 171.97 | 0.453 |
| 2 | MMR2 | 9. | 230.49 | 0.607 | 10. | 266.00 | 0.700 |

DIMENSIONS

| MR NO | MR ID | LENGTH, FT: AVAIL | LENGTH, FT: REQ | WIDTH, FT: AVAIL | WIDTH, FT: REQ | HEIGHT, FT: AVAIL | HEIGHT, FT: REQ |
|---|---|---|---|---|---|---|---|
| 1 | MMR1 | 35.51 | 35.51 | 49.17 | 21.30 | 21.29 | 19.63 |
| 2 | MMR2 | 35.51 | 35.51 | 51.76 | 21.30 | 19.46 | 19.63 |

ARRANGEMENTS

| MR NO | MR ID | ROTATION ANGLE,DEG |
|---|---|---|
| 1 | MMR1 | 0.00 |
| 2 | MMR2 | 0.00 |

PRINTED REPORT NO. 17 - MACHINERY ARRANGEMENTS

CLEARANCES (MACHINERY TO MACHINERY)

| | |
|---|---|
| ENG TO ENG CLR, FT | 1.00 |
| ENG TO GEAR CLR, FT<br>OR ENG TO GEN CLR<br>OR GEAR TO GEN CLR | 1.00 |
| MTR TO GEAR CLR, FT | 2.50 |
| PRPLN ARR TO SS ARR CLR, FT | 6.00 |
| AISLE WIDTH CLR, FT | 2.50 |
| PORT/CL TB TO GEAR CLR, FT | .00 |
| STBD TB TO GEAR CLR, FT | .00 |

SEPARATIONS (BETWEEN HULL AND MACHINERY)

| | |
|---|---|
| LONG (TO BHD), FT | 1.00 |
| TRANS (TO SIDE SHELL), FT | 1.00 |
| VERT (TO HULL BOT), FT | 1.00 |
| RADIAL (TO POD), FT | 1.00 |

ARRANGEMENTS

| ARRANGEMENT | TYPE | NO INSTALLED | NO ONLINE MAX+SUSTN | NO ONLINE ENDURANCE |
|---|---|---|---|---|
| ELECT PG ARR 1 IND | M-PG | 2 | 2 | 1 |
| ELECT PG ARR 2 IND | | 0 | 0 | 0 |
| ELECT DL ARR IND | MTR | 2 | 2 | 2 |
| SHIP SERVICE ARR | DIESEL | 2 | 2 | 1 |

MACHINERY COMPONENT LOCATIONS

| COMPONENT | MR ID | CG LOC, FT X | Y | Z |
|---|---|---|---|---|
| MAIN ENG | MMR1 | 146.91 | -6.17 | 15.00 |
| MAIN ENG | MMR2 | 240.94 | -6.17 | 15.00 |
| SS ENG | MMR1 | 145.77 | 6.98 | 12.00 |
| SS ENG | MMR2 | 239.81 | 6.98 | 12.00 |
| PRPLN MTR | | 356.21 | -8.30 | 3.28 |
| PRPLN MTR | | 356.21 | 8.30 | 3.28 |

SHAFTING

| SHAFT TYPE | END POINT LOC, FT X | Y | Z | SHAFT ANGLE, DEG |
|---|---|---|---|---|
| PORT SHAFT | 349.51 | -8.30 | 2.60 | -5.81 |
| STBD SHAFT | 349.51 | 8.30 | 2.60 | -5.81 |

PRINTED REPORT NO. 18 - MACHINERY SPACE REQUIREMENTS

MACHINERY ROOM VOLUME REQUIREMENTS

| VOLUME CATEGORY | VOLUME, FT3 |
|---|---|
| SWBS GROUP 200 | 71910. |
| PROPULSION POWER GENERATION | 13921. |
| PROPULSION ENGINES | 9126. |
| PROPULSION REDUCTION GEARS AND GENERATORS | 4794. |
| DRIVELINE MACHINERY | 0. |
| REDUCTION AND BEVEL GEARS WITH Z-DRIVE | 0. |
| ELECTRIC PROPULSION MOTORS AND GEARS | 0. |
| REMOTELY-LOCATED THRUST BEARINGS | 0. |
| PROPELLER SHAFT | 0. |
| ELECTRIC PROPULSION MISCELLANEOUS EQUIPMENT | 9922. |
| CONTROLS | 1489. |
| BRAKING RESISTORS | 774. |
| MOTOR AND GENERATOR EXCITERS | 1489. |
| SWITCHGEAR | 726. |
| POWER CONVERTERS | 669. |
| DEIONIZED COOLING WATER SYSTEMS | 2352. |
| RECTIFIERS | 550. |
| HELIUM REFRIGERATION SYSTEMS | 1872. |
| PROPULSION AUXILIARIES | 48068. |
| PROPULSION LOCAL CONTROL CONSOLES | 3601. |
| CP PROP HYDRAULIC OIL POWER MODULES | 0. |
| FUEL OIL PUMPS | 24467. |
| LUBE OIL PUMPS | 2618. |
| LUBE OIL PURIFIERS | 15270. |
| ENGINE LUBE OIL CONDITIONERS | 599. |
| SEAWATER COOLING PUMPS | 1512. |
| SWBS GROUP 300 | 24822. |
| ELECTRIC PLANT POWER GENERATION | 10232. |
| ELECTRIC PLANT ENGINES | 6354. |
| ELECTRIC PLANT GENERATORS AND GEARS | 3879. |
| SHIP SERVICE SWITCHBOARDS | 14590. |
| CYCLOCONVERTERS | 0. |
| SWBS GROUP 500 | 41979. |
| AUXILIARY MACHINERY | 41979. |
| AIR CONDITIONING PLANTS | 8787. |
| AUXILIARY BOILERS | 1135. |
| FIRE PUMPS | 2486. |
| DISTILLING PLANTS | 10881. |
| AIR COMPRESSORS | 5937. |
| ROLL FIN PAIRS | 10157. |
| SEWAGE PLANTS | 2596. |

ARRANGEABLE AREA REQUIREMENTS NOTE: * DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS

| SSCS | GROUP NAME | FT2 HULL/DKHS | FT2 DKHS ONLY |
|---|---|---|---|
| 4.31 | AUXILIARY MACHINERY DELTA | 8419.9 | 0.0 |
| 4.3311 | SHIP SERVICE POWER GENERATION | 0.0 | 0.0 |
| 4.132 | INTERNAL COMB ENG COMB AIR | 0.0 | 0.0 |
| 4.133 | INTERNAL COMB ENG EXHAUST | 69.6 | 69.6 |
| 4.142 | GAS TURBINE ENG COMB AIR | 138.6 | 138.6 |
| 4.143 | GAS TURBINE ENG EXHAUST | 342.6 | 182.1 |

PRINTED REPORT NO. 19 - SURFACE SHIP ENDURANCE CALCULATION FORM

DESIGN MODE IND-ENDURANCE
ENDUR DISP IND-AVG DISP
ENDUR DEF IND-USN
SHIP FUEL TYPE IND-JP-5

ENG ENDUR RPM IND-CALC

SHIP FUEL LHV, BTU/LBM 18300.
DFM FUEL LHV, BTU/LBM 18360.

| | | |
|---|---|---|
| (1) | ENDURANCE REQUIRED, NM | 6000. |
| (2) | ENDURANCE SPEED, KT | 14.00 |
| (3) | FULL LOAD DISPLACEMENT, LTON | 3980.1 |
| (3A) | AVERAGE ENDURANCE DISPLACEMENT, LTON | 3810.6 |
| (4) | RATED FULL POWER SHP, HP | 28775. |
| (5) | DESIGN ENDURANCE POWER SHP @ (2)&(3A), HP | 3238. |
| (6) | AVERAGE ENDURANCE POWER (SHP), HP<br>(5) X 1.10 | 3562. |
| (7) | RATIO, AVG END SHP/RATED F.P. SHP<br>(6)/(4) | 0.12379 |
| (8) | AVERAGE ENDURANCE BHP, HP<br>(8A)+(8B) | 3897. |
| (8A) | AVERAGE PRPLN ENDURANCE BHP, HP<br>(6)/TRANSMISSION EFFICIENCY | 3897. |
| (8B) | SHIP SERV PWR SUPPLIED BY PRPLN ENG, HP | 0. |
| (9) | 24 HOUR AVERAGE ELECTRIC LOAD, KW | 1142. |
| (9A) | 24 HOUR AVERAGE ELECTRIC LOAD PORTION<br>SUPPLIED BY SS ENG, KW | 1142. |
| (10) | CALCULATED PROPULSION FUEL RATE @(8), LBM/HP-HR | 0.342 |
| (11) | CALC PRPLN FUEL CONSUMPTION, LBM/HR<br>(10)X(8) | 1334.2 |
| (12) | CALC SS GEN FUEL RATE @ (9A), LBM/KW-HR | 0.479 |
| (13) | CALC SS GEN FUEL CONSUMPTION, LBM/HR<br>(12)X(9A) | 547.0 |
| (14) | CALC FUEL CONSUMPTION FOR OTHER SERVICES, LBM/HR | 0.0 |
| (15) | TOTAL CALC ALL-PURPOSE FUEL CONSUMPTION, LBM/HR<br>(11)+(13)+14) | 1881.2 |
| (16) | CALC ALL-PURPOSE FUEL RATE, LBM/HP-HR<br>(15)/(6) | 0.528 |
| (17) | FUEL RATE CORRECTION FACTOR BASED ON (7) | 1.0400 |
| (18) | SPECIFIED FUEL RATE, LBM/HP-HR<br>(16)X(17) | 0.549 |
| (19) | AVG ENDURANCE FUEL RATE, LBM/HP-HR<br>(18)X1.05 | 0.577 |
| (20) | ENDURANCE FUEL (BURNABLE), LTON<br>(1)X(6)X(19)/(2)X2240 | 394.3 * |
| (21) | TAILPIPE ALLOWANCE FACTOR | 0.95 |
| (22) | ENDURANCE FUEL LOAD, LTON<br>(20)/(21) | 415.1 |

ENG ENDUR RPM IND- pkÄ?

PRINTED REPORT NO. 20 - MACHINERY MARGINS

PROPULSION PLANT

| | |
|---|---|
| MAIN ENG MAX LOAD FRAC | 1.000 |
| SEC ENG MAX LOAD FRAC | |
| TORQUE MARGIN FAC | 1.200 |

ELECTRIC PLANT

| | |
|---|---|
| SS ENG MAX LOAD FRAC | 1.000 |
| ELECT LOAD DES MARGIN FAC | 0.200 |
| ELECT LOAD SL MARGIN FAC | 0.100 |
| ELECT LOAD IMBAL FAC | 0.900 |

ASSET/MONOSC VERSION 3.3+ - AUXILIARY SYS MODULE - 2/11/95 10.48.51.

PRINTED REPORT NO. 1 - SUMMARY

| | | | |
|---|---|---|---|
| LBP,FT | 380.0 | TOTAL ACCOM | 122.0 |
| BEAM,FT | 51.0 | COLL PROT SYS IND | PRESENT |
| TOTAL AREA,FT2 | 40398. | COMP HTR TYPE IND | ELECTRIC |
| TOTAL VOLUME,FT3 | 498689. | DISTILLER TYPE IND | RE OSMOSIS |
| USABLE FUEL WT,LTON | 394.3 | WATER HTR TYPE IND | INSTANT |
| FULL LOAD WT,LTON | 3980.1 | ANCHOR LOC IND | BOTTOM |
| MAX SHP, HP | 31804. | PRAIRIE SYS IND | PRESENT |
| | | MASKER SYS IND | PRESENT |
| SEP GEN: 5736.0 KW | | | |

| | | | |
|---|---|---|---|
| TOTAL AIRCOND LOAD, TON | 176.1 | TOTAL STEAM LOAD, LB/HR | 110. |
| NO AIRCOND UNITS | 3.0 | AUX BOILER TYPE IND | ELECTRIC |
| TOTAL AIRCOND CAP, TON | 375.0 | NO AUX BOILERS | 2. |
| SWBS 514 WT,LTON | 74.3 | TOTAL AUX BLR CAP, LB/HR | 200. |
| | | SWBS 517 WT,LTON | 0.3 |
| BOAT SELECT IND | GIVEN | | |
| BOAT TYPE IND | RIB | | |
| BOAT COMPLEMENT 2 RIB | | NO FAS STATIONS | 2. |
| SWBS 583 WT,LTON | 9.6 | RAS STATIONS: NO 2. | TYPE BULKHEAD |
| | | SSCS 3.53 AREA,FT2 | 212.9 |
| STRIKE GEAR: NO 2. | TYPE PALLET | SWBS 571 WT,LTON | 10.7 |
| STRK DECK AREA,FT2 | 478.6 | STOWAGE AREA,FT2 | 2427.0 |
| SWBS 572 WT,LTON | 35.1 | SWBS 671 WT,LTON | 4.3 |
| | | SWBS 672 WT,LTON | 27.1 |

PRINTED REPORT NO. 2- AIRCONDITIONING

| | | | |
|---|---|---|---|
| AIRCOND MARGIN | 0.20 | TOTAL ACCOM | 122.0 |
| SHIP AIRCOND LOAD, TON | 146.7 | COLL PROT SYS IND | PRESENT |
| AIRCOND MARGIN LOAD, TON | 29.3 | | |
| TOTAL AIRCOND LOAD, TON | 176.1 | SWBS 514 WT,LTON | 74.3 |
| AIRCOND UNIT CAP, TON | 125.0 | SWBS 514 VCG,FT | 17.2 |
| NO AIRCOND UNITS | 3.0 | | |
| TOTAL AIRCOND CAP, TON | 375.0 | | |

PRINTED REPORT NO. 3- AUXILIARY BOILERS

| | | | |
|---|---|---|---|
| AUX BOILER TYPE IND | ELECTRIC | TOTAL ACCOM | 122.0 |
| NO AUX BOILERS | 2. | COLL PROT SYS IND | PRESENT |
| AUX BLR UNIT CAP, LB/HR | 100. | COMP HTR TYPE IND | ELECTRIC |
| TOTAL AUX BLR CAP, LB/HR | 200. | DISTILLER TYPE IND | RE OSMOSIS |
| SWBS 261 STEAM LOAD | 863. | SWBS 517 WT,LTON | 74.3 |
| SWBS 264 STEAM LOAD | 30. | SWBS 517 VCG,FT | 17.2 |
| SWBS 511 STEAM LOAD | 0. | | |
| SWBS 517 STEAM LOAD | 138. | | |
| SWBS 531 STEAM LOAD | 0. | | |
| SWBS 533 STEAM LOAD | 933. | | |
| SWBS 541 STEAM LOAD | 604. | | |
| SWBS 651 STEAM LOAD | 49. | | |
| SWBS 655 STEAM LOAD | 61. | | |
| | -------- | | |
| TOTAL STEAM LOAD, LB/HR | 110. | | |

PRINTED REPORT NO. 4- BOATS

| | | | |
|---|---|---|---|
| BOAT SELECT IND | GIVEN | BOAT COMP WT,LTON | 7.7 |
| BOAT TYPE IND | RIB | | |
| BOAT COMPLEMENT 2 RIB | | SWBS 583 WT,LTON | 9.6 |
| | | SWBS 583 VCG,FT | 37.0 |

PRINTED REPORT NO. 5- REPLENISHMENT SYSTEMS

| | | | |
|---|---|---|---|
| NO FAS STATIONS | 2. | | |
| FAS STATION WT,LTON | 0.5 | | |
| RAS STATIONS: NO 2. | TYPE BULKHEAD | | |
| RAS STATION WT,LTON | 10.2 | DKHS ONLY AREA,FT2 | 212.9 |
| RAS STATION VCG,FT | 37.0 | SSCS 3.53 AREA,FT2 | 212.9 |
| SWBS 571 WT,LTON | 10.7 | | |
| SWBS 571 VCG,FT | 36.8 | | |

PRINTED REPORT NO. 6- STRIKE GEAR

| STRIKE GEAR: | NO | TYPE |
|---|---|---|
| | 2. | PALLET |

| | |
|---|---|
| STRK DECK AREA,FT2 | 478.6 |
| SWBS 572 WT,LTON | 35.1 |
| SWBS 572 VCG,FT | 23.9 |

PRINTED REPORT NO. 7- STOWAGE SYSTEMS

STOWAGE SSCS SPACES AND ASSOCIATED FACTORS

| SSCS SPACES | STOW UTIL FACTOR | STOW EFF FACTOR | DECK LOAD LB/FT2 | STACK HEIGHT,FT |
|---|---|---|---|---|
| A1390 | 0.36 | 0.45 | 25.00 | 6.50 |
| A2230 | 1.00 | 0.50 | 3.70 | 6.50 |
| A2410 | 0.67 | 0.47 | 14.70 | 6.50 |
| A2620 | 0.58 | 0.45 | 14.70 | 6.50 |
| A3700 | 0.54 | 0.45 | 32.10 | 6.50 |

| | |
|---|---|
| STOWAGE AREA,FT2 | 2427.0 |
| SWBS 671 WT,LTON | 4.3 |
| SWBS 671 VCG,FT | 22.3 |
| SWBS 672 WT,LTON | 27.1 |
| SWBS 672 VCG,FT | 14.2 |

PRINTED REPORT NO. 8 - AUXILIARY SYSTEMS WEIGHT

| SWBS | COMPONENT | WT-LTON | VCG-FT |
|---|---|---|---|
| 500 | AUXILIARY SYSTEMS, GENERAL | 494.2 | 18.80 |
| 510 | CLIMATE CONTROL | 134.0 | 22.40 |
| 511 | COMPARTMENT HEATING SYSTEM | 4.5 | 25.83 |
| 512 | VENTILATION SYSTEM | 44.0 | 28.97 |
| 513 | MACHINERY SPACE VENT SYSTEM | 9.1 | 32.71 |
| 514 | AIR CONDITIONING SYSTEM | 74.3 | 17.24 |
| 516 | REFRIGERATION SYSTEM | 1.9 | 14.97 |
| 517 | AUX BOILERS+OTHER HEAT SOURCES | .3 | 17.63 |
| 520 | SEA WATER SYSTEMS | 40.6 | 19.65 |
| 521 | FIREMAIN+SEA WATER FLUSHING SYS | 21.5 | 18.75 |
| 522 | SPRINKLING SYSTEM | | 21.82 |
| 523 | WASHDOWN SYSTEM | 3.0 | 34.11 |
| 524 | AUXILIARY SEAWATER SYSTEM | | |
| 526 | SCUPPERS+DECK DRAINS | .8 | 31.85 |
| 527 | FIREMAIN ACTUATED SERV, OTHER | | |
| 528 | PLUMBING DRAINAGE | 12.0 | 19.64 |
| 529 | DRAINAGE+BALLASTING SYSTEM | 3.4 | 9.91 |
| 530 | FRESH WATER SYSTEMS | 23.8 | 20.74 |
| 531 | DISTILLING PLANT | 3.8 | 15.91 |
| * 532 | COOLING WATER | 4.0 | 47.47 |
| 533 | POTABLE WATER | 6.0 | 19.70 |
| 534 | AUX STEAM + DRAINS IN MACH BOX | 10.0 | 12.49 |
| 535 | AUX STEAM + DRAINS OUT MACH BOX | | |
| 536 | AUXILIARY FRESH WATER COOLING | | |
| 540 | FUELS/LUBRICANTS,HANDLING+STORAGE | 31.1 | 12.53 |
| 541 | SHIP FUEL+COMPENSATING SYSTEM | 29.8 | 12.91 |
| 542 | AVIATION+GENERAL PURPOSE FUELS | | |
| 543 | AVIATION+GENERAL PURPOSE LUBO | | |
| 544 | LIQUID CARGO | | |
| 545 | TANK HEATING | 1.3 | 3.88 |
| 549 | SPEC FUEL+LUBRICANTS HANDL+STOW | | |
| 550 | AIR,GAS+MISC FLUID SYSTEM | 43.5 | 18.69 |
| 551 | COMPRESSED AIR SYSTEMS | 20.1 | 16.63 |
| 552 | COMPRESSED GASES | | |
| 553 | O2 N2 SYSTEM | | |
| 554 | LP BLOW | | |
| 555 | FIRE EXTINGUISHING SYSTEMS | 23.5 | 20.47 |
| 556 | HYDRAULIC FLUID SYSTEM | | |
| 557 | LIQUID GASES, CARGO | | |
| 558 | SPECIAL PIPING SYSTEMS | | |
| 560 | SHIP CNTL SYS | 75.6 | 5.63 |
| 561 | STEERING+DIVING CNTL SYS | 11.7 | 17.36 |
| 562 | RUDDER | 27.4 | 7.00 |
| 565 | TRIM+HEEL SYSTEMS | 36.5 | .83 |
| 568 | MANEUVERING SYSTEMS | | |
| 570 | UNDERWAY REPLENISHMENT SYSTEMS | 45.8 | 26.91 |
| 571 | REPLENISHMENT-AT-SEA SYSTEMS | 10.7 | 36.82 |
| 572 | SHIP STORES+EQUIP HANDLING SYS | 35.1 | 23.88 |
| 573 | CARGO HANDLING SYSTEMS | | |

| | | | | |
|---|---|---|---|---|
| | 574 | VERTICAL REPLENISHMENT SYSTEMS | | |
| | 580 | MECHANICAL HANDLING SYSTEMS | 48.7 | 26.27 |
| | 581 | ANCHOR HANDLING+STOWAGE SYSTEMS | 24.1 | 18.78 |
| | 582 | MOORING+TOWING SYSTEMS | 10.1 | 30.76 |
| | 583 | BOATS,HANDLING+STOWAGE SYSTEMS | 9.6 | 37.00 |
| | 584 | MECH OPER DOOR,GATE,RAMP,TTBL SYS | | |
| | 585 | ELEVATING + RETRACTING GEAR | | |
| | 586 | AIRCRAFT RECOVERY SUPPORT SYS | | |
| | 587 | AIRCRAFT LAUNCH SUPPORT SYSTEM | | |
| * | 588 | AIRCRAFT HANDLING,SERVICING,STOWAGE | 5.0 | 32.76 |
| | 589 | MISC MECH HANDLING SYSTEMS | | |
| | 590 | SPECIAL PURPOSE SYSTEMS | 51.0 | 16.75 |
| | 591 | SCIENTIFIC+OCEAN ENGINEERING SYS | | |
| | 592 | SWIMMER+DIVER SUPPORT+PROT SYS | | |
| | 593 | ENVIRONMENTAL POLLUTION CNTL SYS | 9.8 | 11.38 |
| | 594 | SUBMARINE RESC+SALVG+SURVIVE SYS | | |
| | 595 | TOW,LAUNCH,HANDLE UNDERWATER SYS | | |
| | 596 | HANDLING SYS FOR DIVER+SUBMR VEH | | |
| | 597 | SALVAGE SUPPORT SYSTEMS | | |
| | 598 | AUX SYSTEMS OPERATING FLUIDS | 35.7 | 18.34 |
| | 599 | AUX SYSTEMS REPAIR PARTS+TOOLS | 5.4 | 16.01 |

OUTFIT+FURNISHINGS WEIGHT

| SWBS | COMPONENT | WT-LTON | VCG-FT |
|---|---|---|---|
| 671 | LOCKERS+SPECIAL STOWAGE | 4.3 | 22.29 |
| 672 | STOREROOMS+ISSUE ROOMS | 27.1 | 14.15 |

* DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS
ASSET/MONOSC VERSION 3.3+ - WEIGHT MODULE - 2/11/95 10.49.06.

PRINTED REPORT NO. 1 - SUMMARY

| SWBS | GROUP | WEIGHT LTON | WEIGHT PER CENT | LCG FT | VCG FT | RESULTANT ADJ WT-LTON | RESULTANT ADJ VCG-FT |
|---|---|---|---|---|---|---|---|
| 100 | HULL STRUCTURE | 1320.9 | 33.2 | 187.33 | 21.35 | | |
| 200 | PROP PLANT | 281.3 | 7.1 | 246.35 | 13.45 | | |
| 300 | ELECT PLANT | 261.7 | 6.6 | 198.72 | 16.88 | | |
| 400 | COMM + SURVEIL | 144.9 | 3.6 | 144.40 | 25.34 | 97.6 | .60 |
| 500 | AUX SYSTEMS | 494.2 | 12.4 | 209.00 | 18.80 | | |
| 600 | OUTFIT + FURN | 314.0 | 7.9 | 190.00 | 20.68 | | |
| 700 | ARMAMENT | 209.6 | 5.3 | 171.00 | 18.29 | 197.4 | .92 |
| M11 | D+B WT MARGIN | 378.3 | 9.5 | 194.43 | 19.72 | | |
| | D+B KG MARGIN | | | + | 2.47 | | |
| | LIGHTSHIP | 3405.0 | 85.6 | 194.43 | 22.19 | 295.0 | 1.52 |
| F00 | FULL LOADS | 575.1 | 14.4 | 203.24 | 5.24 | 108.4 | .26 |
| F10 | CREW + EFFECTS | 13.0 | | 178.60 | 22.98 | | |
| F20 | MISS REL EXPEN | 44.6 | | 167.20 | 9.48 | | |
| F30 | SHIPS STORES | 17.4 | | 205.20 | 17.23 | | |
| F40 | FUELS + LUBRIC | 482.0 | | 208.11 | 3.97 | | |
| F50 | FRESH WATER | 18.1 | | | 4.33 | | |
| F60 | CARGO | | | | | | |
| M24 | FUTURE GROWTH | | | | | | |
| | FULL LOAD WT | 3980.1 | 100.0 | 195.70 | 19.74 | 403.4 | 1.78 |

PRINTED REPORT NO. 2 - HULL STRUCTURES WEIGHT

| SWBS | COMPONENT | WT-LTON | VCG-FT |
|---|---|---|---|
| 100 | HULL STRUCTURES | 1320.9 | 21.35 |
| 110 | SHELL + SUPPORTS | 379.3 | 13.49 |
| 111 | PLATING | 218.6 | 18.75 |
| 113 | INNER BOTTOM | 36.5 | 4.50 |
| 114 | SHELL APPENDAGES | 17.2 | 3.69 |
| 115 | STANCHIONS | 5.1 | 15.00 |
| 116 | LONGIT FRAMING | 63.8 | 1.47 |
| 117 | TRANSV FRAMING | 38.1 | 16.24 |
| 120 | HULL STRUCTURAL BULKHDS | 78.0 | 18.79 |
| 121 | LONGIT STRUCTURAL BULKHDS | | |
| 122 | TRANSV STRUCTURAL BULKHDS | 66.6 | 18.79 |
| 123 | TRUNKS + ENCLOSURES | 11.3 | 18.79 |
| 124 | BULKHEADS, TORPEDO PROTECT SYS | | |
| 130 | HULL DECKS | 261.0 | 26.76 |
| 131 | MAIN DECK | 153.3 | 31.05 |
| 132 | 2ND DECK | 107.7 | 20.66 |
| 133 | 3RD DECK | | |
| 134 | 4TH DECK | | |
| 135 | 5TH DECK+DECKS BELOW | | |
| 136 | 01 HULL DECK | | |
| 137 | 02 HULL DECK | | |
| 138 | 03 HULL DECK | | |
| 139 | 04 HULL DECK | | |
| 140 | HULL PLATFORMS/FLATS | 58.2 | 12.21 |
| 141 | 1ST PLATFORM | 58.2 | 12.21 |
| 142 | 2ND PLATFORM | | |
| 143 | 3RD PLATFORM | | |
| 144 | 4TH PLATFORM | | |
| 145 | 5TH PLAT+PLATS BELOW | | |
| 149 | FLATS | | |
| 150 | DECK HOUSE STRUCTURE | 212.7 | 36.29 |
| 160 | SPECIAL STRUCTURES | 61.5 | 15.94 |
| 161 | CASTINGS+FORGINGS+EQUIV WELDMT | 33.1 | 9.19 |
| 162 | STACKS AND MACKS | 2.1 | 46.46 |
| 163 | SEA CHESTS | 3.3 | 3.70 |
| 164 | BALLISTIC PLATING | | |
| 165 | SONAR DOMES | | |
| 166 | SPONSONS | | |
| 167 | HULL STRUCTURAL CLOSURES | 18.1 | 21.97 |
| 168 | DKHS STRUCTURAL CLOSURES | .8 | 38.64 |
| 169 | SPECIAL PURPOSE CLOSURES+STRUCT | 4.2 | 33.05 |
| 170 | MASTS+KINGPOSTS+SERV PLATFORM | 31.6 | 79.40 |
| 171 | MASTS,TOWERS,TETRAPODS | 31.6 | 79.40 |
| 172 | KINGPOSTS AND SUPPORT FRAMES | | |
| 179 | SERVICE PLATFORMS | | |
| 180 | FOUNDATIONS | 225.5 | 11.81 |
| 181 | HULL STRUCTURE FOUNDATIONS | | |
| 182 | PROPULSION PLANT FOUNDATIONS | 93.2 | 7.48 |
| 183 | ELECTRIC PLANT FOUNDATIONS | 45.8 | 12.82 |
| 184 | COMMAND+SURVEILLANCE FDNS | 11.9 | 23.57 |
| 185 | AUXILIARY SYSTEMS FOUNDATIONS | 49.4 | 14.03 |
| 186 | OUTFIT+FURNISHINGS FOUNDATIONS | 9.5 | 18.08 |
| 187 | ARMAMENT FOUNDATIONS | 15.7 | 14.84 |
| 190 | SPECIAL PURPOSE SYSTEMS | 13.1 | 4.00 |
| 191 | BALLAST+BOUYANCY UNITS | | |
| 197 | WELDING AND RIVETS | | |
| 198 | FREE FLOODING LIQUIDS | 13.1 | 4.00 |

* DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS

PRINTED REPORT NO. 3 - PROPULSION PLANT WEIGHT

| SWBS | COMPONENT | WT-LTON | VCG-FT |
|---|---|---|---|
| 200 | PROPULSION PLANT | 281.3 | 13.45 |
| 210 | ENERGY GEN SYS (NUCLEAR) | | |
| 220 | ENERGY GENERATING SYSTEM (NONNUC) | | |
| 221 | PROPULSION BOILERS | | |
| 222 | GAS GENERATORS | | |
| 223 | MAIN PROPULSION BATTERIES | | |
| 224 | MAIN PROPULSION FUEL CELLS | | |
| 230 | PROPULSION UNITS | 186.8 | 12.19 |
| 231 | STEAM TURBINES | | |
| 232 | STEAM ENGINES | | |
| 233 | DIESEL ENGINES | | |
| 234 | GAS TURBINES | 60.8 | 17.38 |
| 235 | ELECTRIC PROPULSION | 126.0 | 9.68 |
| 236 | SELF-CONTAINED PROPULSION SYS | | |
| 237 | AUXILIARY PROPULSION DEVICES | | |
| 240 | TRANSMISSION+PROPULSOR SYSTEMS | 21.7 | 2.36 |
| 241 | REDUCTION GEARS | | |
| 242 | CLUTCHES + COUPLINGS | | |
| 243 | SHAFTING | 1.4 | 2.45 |
| 244 | SHAFT BEARINGS | 6.3 | 2.71 |
| 245 | PROPULSORS | 14.0 | 2.19 |
| 246 | PROPULSOR SHROUDS AND DUCTS | | |
| 247 | WATER JET PROPULSORS | | |
| 250 | SUPPORT SYSTEMS | 36.6 | 28.42 |
| 251 | COMBUSTION AIR SYSTEM | 10.5 | 27.43 |
| 252 | PROPULSION CONTROL SYSTEM | 9.4 | 19.50 |
| 253 | MAIN STEAM PIPING SYSTEM | | |
| 254 | CONDENSERS AND AIR EJECTORS | | |
| 255 | FEED AND CONDENSATE SYSTEM | | |
| 256 | CIRC + COOL SEA WATER SYSTEM | 2.6 | 10.80 |
| 258 | H.P. STEAM DRAIN SYSTEM | | |
| 259 | UPTAKES (INNER CASING) | 14.2 | 38.18 |
| 260 | PROPUL SUP SYS- FUEL, LUBE OIL | 23.7 | 12.44 |
| 261 | FUEL SERVICE SYSTEM | 9.4 | 11.38 |
| 262 | MAIN PROPULSION LUBE OIL SYSTEM | 10.2 | 12.00 |
| 264 | LUBE OIL HANDLING | 4.1 | 16.00 |
| 290 | SPECIAL PURPOSE SYSTEMS | 12.5 | 9.55 |
| 298 | OPERATING FLUIDS | 9.3 | 8.00 |
| 299 | REPAIR PARTS + TOOLS | 3.2 | 14.10 |

* DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS

PRINTED REPORT NO. 4 - ELECTRIC PLANT WEIGHT

| SWBS | COMPONENT | WT-LTON | VCG-FT |
|---|---|---|---|
| 300 | ELECTRIC PLANT, GENERAL | 261.7 | 16.88 |
| 310 | ELECTRIC POWER GENERATION | 129.3 | 12.16 |
| 311 | SHIP SERVICE POWER GENERATION | 94.1 | 12.00 |
| 312 | EMERGENCY GENERATORS | | |
| 313 | BATTERIES+SERVICE FACILITIES | 24.1 | 6.00 |
| 314 | POWER CONVERSION EQUIPMENT | 11.0 | 27.00 |
| 320 | POWER DISTRIBUTION SYS | 55.6 | 24.76 |
| 321 | SHIP SERVICE POWER CABLE | 34.9 | 27.00 |
| 322 | EMERGENCY POWER CABLE SYS | | |
| 323 | CASUALTY POWER CABLE SYS | | |
| 324 | SWITCHGEAR+PANELS | 20.7 | 21.00 |
| 330 | LIGHTING SYSTEM | 18.8 | 27.22 |
| 331 | LIGHTING DISTRIBUTION | 11.8 | 27.00 |
| 332 | LIGHTING FIXTURES | 7.0 | 27.60 |
| 340 | POWER GENERATION SUPPORT SYS | 39.2 | 17.56 |
| 341 | SSTG LUBE OIL | | |
| 342 | DIESEL SUPPORT SYS | 39.2 | 17.56 |
| 343 | TURBINE SUPPORT SYS | | |
| 390 | SPECIAL PURPOSE SYS | 18.8 | 14.25 |
| 398 | ELECTRIC PLANT OP FLUIDS | 14.1 | 12.00 |
| 399 | REPAIR PARTS+SPECIAL TOOLS | 4.7 | 21.00 |

* DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS

PRINTED REPORT NO. 5 - COMMAND+SURVEILLANCE WEIGHT

| | SWBS | COMPONENT | WT-LTON | VCG-FT |
|---|---|---|---|---|
| | 400 | COMMAND+SURVEILLANCE | 144.9 | 25.34 |
| * | 410 | COMMAND+CONTROL SYS | 37.0 | 1.47 |
| | 411 | DATA DISPLAY GROUP | | |
| | 412 | DATA PROCESSING GROUP | | |
| | 413 | DIGITAL DATA SWITCHBOARDS | | |
| | 414 | INTERFACE EQUIPMENT | | |
| | 415 | DIGITAL DATA COMMUNICATIONS | | |
| | 417 | COMMAND+CONTROL ANALOG SWBD | | |
| * | 420 | NAVIGATION SYS | 3.8 | 45.94 |
| | 430 | INTERIOR COMMUNICATIONS | 18.7 | 25.42 |
| * | 440 | EXTERIOR COMMUNICATIONS | 16.0 | 21.80 |
| | 441 | RADIO SYSTEMS | | |
| | 442 | UNDERWATER SYSTEMS | | |
| | 443 | VISUAL + AUDIBLE SYSTEMS | | |
| | 444 | TELEMETRY SYSTEMS | | |
| | 445 | TTY + FACSIMILE SYSTEMS | | |
| | 446 | SECURITY EQUIPMENT SYSTEMS | | |
| | 450 | SURF SURV SYS (RADAR) | 22.0 | 61.59 |
| * | 451 | SURFACE SEARCH RADAR | 1.8 | 59.50 |
| | 452 | AIR SEARCH RADAR (2D) | | |
| | 453 | AIR SEARCH RADAR (3D) | | |
| | 454 | AIRCRAFT CONTROL APPROACH RADAR | | |
| * | 455 | IDENTIFICATION SYSTEMS (IFF) | 2.3 | 60.00 |
| * | 456 | MULTIPLE MODE RADAR | 18.0 | 62.00 |
| | 459 | SPACE VEHICLE ELECTRONIC TRACKG | | |
| * | 460 | UNDERWATER SURVEILLANCE SYSTEMS | 14.3 | 25.83 |
| | 461 | ACTIVE SONAR | | |
| * | 462 | PASSIVE SONAR | 14.1 | 25.76 |
| | 463 | MULTIPLE MODE SONAR | | |
| | 464 | CLASSIFICATION SONAR | | |
| | 465 | BATHYTHERMOGRAPH | | |
| | 466 | LAMPS ELECTRONICS | | |
| | 470 | COUNTERMEASURES | 22.3 | 25.57 |
| | 471 | ACTIVE + ACTIVE/PASSIVE ECM | | |
| * | 472 | PASSIVE ECM | 3.0 | 51.00 |
| * | 473 | TORPEDO DECOYS | 3.6 | 22.76 |
| | 474 | DECOYS (OTHER) | | |
| | 475 | DEGAUSSING | 15.7 | 21.34 |
| | 476 | MINE COUNTERMEASURES | | |
| | 480 | FIRE CONTROL SYS | | |
| | 481 | GUN FIRE CONTROL SYSTEMS | | |
| | 482 | MISSILE FIRE CONTROL SYSTEMS | | |
| | 483 | UNDERWATER FIRE CONTROL SYSTEMS | | |
| | 484 | INTEGRATED FIRE CONTROL SYSTEMS | | |
| | 489 | WEAPON SYSTEM SWITCHBOARDS | | |
| | 490 | SPECIAL PURPOSE SYS | 10.8 | 29.81 |
| * | 491 | ELCTRNC TEST,CHKOUT,MONITR EQPT | 6.3 | 33.72 |
| | 492 | FLIGHT CNTRL+INSTR LANDING SYS | | |
| | 493 | NON-COMBAT DATA PROCESSING SYS | 2.3 | 21.82 |
| | 494 | METEOROLOGICAL SYSTEMS | | |
| | 495 | SPEC PURPOSE INTELLIGENCE SYS | | |
| | 498 | C+S OPERATING FLUIDS | | |
| | 499 | REPAIR PARTS+SPECIAL TOOLS | 2.1 | 26.99 |

* DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS

PRINTED REPORT NO. 6 - AUXILIARY SYSTEMS WEIGHT

| SWBS | COMPONENT | WT-LTON | VCG-FT |
|---|---|---|---|
| 500 | AUXILIARY SYSTEMS, GENERAL | 494.2 | 18.80 |
| 510 | CLIMATE CONTROL | 134.0 | 22.40 |
| 511 | COMPARTMENT HEATING SYSTEM | 4.5 | 25.83 |
| 512 | VENTILATION SYSTEM | 44.0 | 28.97 |
| 513 | MACHINERY SPACE VENT SYSTEM | 9.1 | 32.71 |
| 514 | AIR CONDITIONING SYSTEM | 74.3 | 17.24 |
| 516 | REFRIGERATION SYSTEM | 1.9 | 14.97 |
| 517 | AUX BOILERS+OTHER HEAT SOURCES | .3 | 17.63 |
| 520 | SEA WATER SYSTEMS | 40.6 | 19.65 |
| 521 | FIREMAIN+SEA WATER FLUSHING SYS | 21.5 | 18.75 |
| 522 | SPRINKLING SYSTEM | | 21.82 |
| 523 | WASHDOWN SYSTEM | 3.0 | 34.11 |
| 524 | AUXILIARY SEAWATER SYSTEM | | |
| 526 | SCUPPERS+DECK DRAINS | .8 | 31.85 |
| 527 | FIREMAIN ACTUATED SERV, OTHER | | |
| 528 | PLUMBING DRAINAGE | 12.0 | 19.64 |
| 529 | DRAINAGE+BALLASTING SYSTEM | 3.4 | 9.91 |

| | | | | |
|---|---|---|---|---|
| | 530 | FRESH WATER SYSTEMS | 23.8 | 20.74 |
| | 531 | DISTILLING PLANT | 3.8 | 15.91 |
| * | 532 | COOLING WATER | 4.0 | 47.47 |
| | 533 | POTABLE WATER | 6.0 | 19.70 |
| | 534 | AUX STEAM + DRAINS IN MACH BOX | 10.0 | 12.49 |
| | 535 | AUX STEAM + DRAINS OUT MACH BOX | | |
| | 536 | AUXILIARY FRESH WATER COOLING | | |
| | 540 | FUELS/LUBRICANTS,HANDLING+STORAGE | 31.1 | 12.53 |
| | 541 | SHIP FUEL+COMPENSATING SYSTEM | 29.8 | 12.91 |
| | 542 | AVIATION+GENERAL PURPOSE FUELS | | |
| | 543 | AVIATION+GENERAL PURPOSE LUBO | | |
| | 544 | LIQUID CARGO | | |
| | 545 | TANK HEATING | 1.3 | 3.88 |
| | 549 | SPEC FUEL+LUBRICANTS HANDL+STOW | | |
| | 550 | AIR,GAS+MISC FLUID SYSTEM | 43.5 | 18.69 |
| | 551 | COMPRESSED AIR SYSTEMS | 20.1 | 16.63 |
| | 552 | COMPRESSED GASES | | |
| | 553 | O2 N2 SYSTEM | | |
| | 554 | LP BLOW | | |
| | 555 | FIRE EXTINGUISHING SYSTEMS | 23.5 | 20.47 |
| | 556 | HYDRAULIC FLUID SYSTEM | | |
| | 557 | LIQUID GASES, CARGO | | |
| | 558 | SPECIAL PIPING SYSTEMS | | |
| | 560 | SHIP CNTL SYS | 75.6 | 5.63 |
| | 561 | STEERING+DIVING CNTL SYS | 11.7 | 17.36 |
| | 562 | RUDDER | 27.4 | 7.00 |
| | 565 | TRIM+HEEL SYSTEMS | 36.5 | .83 |
| | 568 | MANEUVERING SYSTEMS | | |
| | 570 | UNDERWAY REPLENISHMENT SYSTEMS | 45.8 | 26.91 |
| | 571 | REPLENISHMENT-AT-SEA SYSTEMS | 10.7 | 36.82 |
| | 572 | SHIP STORES+EQUIP HANDLING SYS | 35.1 | 23.88 |
| | 573 | CARGO HANDLING SYSTEMS | | |
| | 574 | VERTICAL REPLENISHMENT SYSTEMS | | |
| | 580 | MECHANICAL HANDLING SYSTEMS | 48.7 | 26.27 |
| | 581 | ANCHOR HANDLING+STOWAGE SYSTEMS | 24.1 | 18.78 |
| | 582 | MOORING+TOWING SYSTEMS | 10.1 | 30.76 |
| | 583 | BOATS,HANDLING+STOWAGE SYSTEMS | 9.6 | 37.00 |
| | 584 | MECH OPER DOOR,GATE,RAMP,TTBL SYS | | |
| | 585 | ELEVATING + RETRACTING GEAR | | |
| | 586 | AIRCRAFT RECOVERY SUPPORT SYS | | |
| | 587 | AIRCRAFT LAUNCH SUPPORT SYSTEM | | |
| * | 588 | AIRCRAFT HANDLING,SERVICING,STOWAGE | 5.0 | 32.76 |
| | 589 | MISC MECH HANDLING SYSTEMS | | |
| | 590 | SPECIAL PURPOSE SYSTEMS | 51.0 | 16.75 |
| | 591 | SCIENTIFIC+OCEAN ENGINEERING SYS | | |
| | 592 | SWIMMER+DIVER SUPPORT+PROT SYS | | |
| | 593 | ENVIRONMENTAL POLLUTION CNTL SYS | 9.8 | 11.38 |
| | 594 | SUBMARINE RESC+SALVG+SURVIVE SYS | | |
| | 595 | TOW,LAUNCH,HANDLE UNDERWATER SYS | | |
| | 596 | HANDLING SYS FOR DIVER+SUBMR VEH | | |
| | 597 | SALVAGE SUPPORT SYSTEMS | | |
| | 598 | AUX SYSTEMS OPERATING FLUIDS | 35.7 | 18.34 |
| | 599 | AUX SYSTEMS REPAIR PARTS+TOOLS | 5.4 | 16.01 |

* DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS

PRINTED REPORT NO. 7 - OUTFIT+FURNISHINGS WEIGHT

| SWBS | COMPONENT | WT-LTON | VCG-FT |
|---|---|---|---|
| 600 | OUTFIT+FURNISHING,GENERAL | 314.0 | 20.68 |
| 610 | SHIP FITTINGS | 8.9 | 35.34 |
| 611 | HULL FITTINGS | 1.8 | 28.15 |
| 612 | RAILS,STANCHIONS+LIFELINES | 6.3 | 36.29 |
| 613 | RIGGING+CANVAS | .8 | 43.55 |
| 620 | HULL COMPARTMENTATION | 72.7 | 19.05 |
| 621 | NON-STRUCTURAL BULKHEADS | 19.4 | 27.15 |
| 622 | FLOOR PLATES+GRATING | 38.9 | 12.74 |
| 623 | LADDERS | 9.3 | 22.25 |
| 624 | NON-STRUCTURAL CLOSURES | 3.9 | 26.99 |
| 625 | AIRPORTS,FIXED PORTLIGHTS,WINDOWS | 1.1 | 43.87 |
| 630 | PRESERVATIVES+COVERINGS | 128.2 | 20.84 |
| 631 | PAINTING | 31.2 | 17.24 |
| 632 | ZINC COATING | | |
| 633 | CATHODIC PROTECTION | 2.2 | 7.00 |
| 634 | DECK COVERINGS | 26.9 | 23.67 |
| 635 | HULL INSULATION | 41.5 | 26.62 |
| 636 | HULL DAMPING | 13.3 | 4.04 |
| 637 | SHEATHING | 8.2 | 28.80 |
| 638 | REFRIGERATION SPACES | 4.9 | 17.67 |
| 639 | RADIATION SHIELDING | | |
| 640 | LIVING SPACES | 24.7 | 21.78 |
| 641 | OFFICER BERTHING+MESSING | 6.8 | 30.55 |
| 642 | NON-COMM OFFICER B+M | 3.0 | 23.13 |
| 643 | ENLISTED PERSONNEL B+M | 12.1 | 16.58 |
| 644 | SANITARY SPACES+FIXTURES | 1.5 | 22.25 |
| 645 | LEISURE+COMMUNITY SPACES | 1.2 | 20.07 |
| 650 | SERVICE SPACES | 9.9 | 22.15 |
| 651 | COMMISSARY SPACES | 4.9 | 22.25 |
| 652 | MEDICAL SPACES | 1.3 | 25.09 |
| 653 | DENTAL SPACES | | |
| 654 | UTILITY SPACES | 1.2 | 25.31 |
| 655 | LAUNDRY SPACES | 2.2 | 18.33 |
| 656 | TRASH DISPOSAL SPACES | .4 | 23.13 |
| 660 | WORKING SPACES | 35.0 | 23.60 |
| 661 | OFFICES | 10.3 | 23.78 |
| 662 | MACH CNTL CENTER FURNISHING | .7 | 13.76 |
| 663 | ELECT CNTL CENTER FURNISHING | 5.3 | 29.45 |
| 664 | DAMAGE CNTL STATIONS | 8.0 | 24.22 |
| 665 | WORKSHOPS,LABS,TEST AREAS | 10.7 | 20.73 |
| 670 | STOWAGE SPACES | 31.4 | 15.26 |
| 671 | LOCKERS+SPECIAL STOWAGE | 4.3 | 22.29 |
| 672 | STOREROOMS+ISSUE ROOMS | 27.1 | 14.15 |
| 673 | CARGO STOWAGE | | |
| 690 | SPECIAL PURPOSE SYSTEMS | 3.3 | 18.94 |
| 698 | OPERATING FLUIDS | .2 | 20.18 |
| 699 | REPAIR PARTS+SPECIAL TOOLS | 3.1 | 18.87 |

* DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS

PRINTED REPORT NO. 8 - ARMAMENT WEIGHT

| SWBS | COMPONENT | WT-LTON | VCG-FT |
|---|---|---|---|
| 700 | ARMAMENT | 209.6 | 18.29 |
| * 710 | GUNS+AMMUNITION | 36.3 | 27.00 |
| 711 | GUNS | | |
| 712 | AMMUNITION HANDLING | | |
| 713 | AMMUNITION STOWAGE | | |
| 720 | MISSLES+ROCKETS | 157.0 | 16.70 |
| * 721 | LAUNCHING DEVICES | 157.0 | 16.70 |
| 722 | MISSILE,ROCKET,GUID CAP HANDL SYS | | |
| 723 | MISSILE+ROCKET STOWAGE | | |
| 724 | MISSILE HYDRAULICS | | |
| 725 | MISSILE GAS | | |
| 726 | MISSILE COMPENSATING | | |
| 727 | MISSILE LAUNCHER CONTROL | | |
| 728 | MISSILE HEAT,COOL,TEMP CNTRL | | |
| 729 | MISSILE MONITOR,TEST,ALINEMENT | | |
| 730 | MINES | | |
| 731 | MINE LAUNCHING DEVICES | | |
| 732 | MINE HANDLING | | |
| 733 | MINE STOWAGE | | |
| 740 | DEPTH CHARGES | | |
| 741 | DEPTH CHARGE LAUNCHING DEVICES | | |
| 742 | DEPTH CHARGE HANDLING | | |
| 743 | DEPTH CHARGE STOWAGE | | |

| | | | | |
|---|---|---|---|---|
| * | 750 | TORPEDOES | 2.7 | 2.50 |
| | 751 | TORPEDO TUBES | | |
| | 752 | TORPEDO HANDLING | | |
| | 753 | TORPEDO STOWAGE | | |
| | 760 | SMALL ARMS+PYROTECHNICS | 1.7 | 27.30 |
| | 761 | SMALL ARMS+PYRO LAUNCHING DEV | 1.0 | 27.30 |
| | 762 | SMALL ARMS+PYRO HANDLING | | |
| | 763 | SMALL ARMS+PYRO STOWAGE | .7 | 27.30 |
| | 770 | CARGO MUNITIONS | | |
| | 772 | CARGO MUNITIONS HANDLING | | |
| | 773 | CARGO MUNITIONS STOWAGE | | |
| * | 780 | AIRCRAFT RELATED WEAPONS | 1.4 | 28.30 |
| | 782 | AIRCRAFT RELATED WEAPONS HANDL | | |
| | 783 | AIRCRAFT RELATED WEAPONS STOW | | |
| | 790 | SPECIAL PURPOSE SYSTEMS | 10.5 | 13.23 |
| | 791 | SPECIAL WEAPONS | | |
| | 792 | SPECIAL WEAPONS HANDLING | | |
| | 793 | SPECIAL WEAPONS STOWAGE | | |
| | 797 | MISC ORDINANCE SPACES | | |
| | 798 | ARMAMENT OPERATING FLUIDS | 2.3 | 19.30 |
| | 799 | ARMAMENT REPAIR PART+TOOLS | 8.1 | 11.51 |

* DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS

PRINTED REPORT NO. 9 - LOADS WEIGHT (FULL LOAD CONDITION)

| | SWBS | COMPONENT | WT-LTON | VCG-FT |
|---|---|---|---|---|
| | F00 | LOADS | 575.1 | 5.24 |
| | F10 | SHIPS FORCE | 13.0 | 22.98 |
| | F11 | OFFICERS | 2.7 | 22.98 |
| | F12 | NON-COMMISSIONED OFFICERS | 1.9 | 22.98 |
| | F13 | ENLISTED MEN | 8.4 | 22.98 |
| | F14 | MARINES | | |
| | F15 | TROOPS | | |
| | F16 | AIR WING PERSONNEL | | |
| | F19 | OTHER PERSONNEL | | |
| | F20 | MISSION RELATED EXPENDABLES+SYS | 44.6 | 9.48 |
| * | F21 | SHIP AMMUNITION | 38.2 | 8.72 |
| | F22 | ORD DEL SYS AMMO | | |
| * | F23 | ORD DEL SYS (AIRCRAFT) | 4.4 | 5.00 |
| | F24 | ORD REPAIR PARTS (SHIP) | | |
| | F25 | ORD REPAIR PARTS (ORD) | | |
| * | F26 | ORD DEL SYS SUPPORT EQUIP | 2.0 | 33.76 |
| | F29 | SPECIAL MISSION RELATED SYS | | |
| | F30 | STORES | 17.4 | 17.23 |
| | F31 | PROVISIONS+PERSONNEL STORES | 14.2 | 16.82 |
| | F32 | GENERAL STORES | 3.2 | 19.05 |
| | F33 | MARINES STORES (SHIPS COMPLEM) | | |
| | F39 | SPECIAL STORES | | |
| | F40 | LIQUIDS, PETROLEUM BASED | 482.0 | 3.97 |
| | F41 | DIESEL FUEL MARINE | 415.1 | 3.10 |
| * | F42 | JP-5 | 63.8 | 9.84 |
| | F43 | GASOLINE | | |
| | F44 | DISTILLATE FUEL | | |
| | F45 | NAVY STANDARD FUEL OIL (NSFO) | | |
| | F46 | LUBRICATING OIL | 3.1 | |
| | F49 | SPECIAL FUELS AND LUBRICANTS | | |
| | F50 | LIQUIDS, NON-PETRO BASED | 18.1 | 4.33 |
| | F51 | SEA WATER | | |
| | F52 | FRESH WATER | 18.1 | 4.33 |
| | F53 | RESERVE FEED WATER | | |
| | F54 | HYDRAULIC FLUID | | |
| | F55 | SANITARY TANK LIQUID | | |
| | F56 | GAS (NON FUEL TYPE) | | |
| | F59 | MISC LIQUIDS, NON-PETROLEUM | | |
| | F60 | CARGO | | |
| | F61 | CARGO, ORDINANCE + DELIVERY SYS | | |
| | F62 | CARGO, STORES | | |
| | F63 | CARGO, FUELS + LUBRICANTS | | |
| | F64 | CARGO, LIQUIDS, NON-PETROLEUM | | |
| | F65 | CARGO, CRYOGENIC+LIQUEFIED GAS | | |
| | F66 | CARGO, AMPHIBIOUS ASSAULT SYS | | |
| | F67 | CARGO, GASES | | |
| | F69 | CARGO, MISCELLANEOUS | | |
| | M24 | FUTURE GROWTH MARGIN | | |

* DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS

PRINTED REPORT NO. 10 - WEIGHT AND KG MODIFICATION SUMMARY

| ROW | P+A NAME / WT KEYS | ORIGINAL WT, LTON | WT CHNG, LTON | RESULTNT WT, LTON | ORIGINAL KG, FT | KG CHNG, FT | RESU LTNT KG, FT |
|---|---|---|---|---|---|---|---|
| 1 | CIC COMMAND AND DECISION MODFIG | | | | | | |
| | W410 | 0.0 | 7.0 | | UNKNOWN | -7.2 | |
| 11 | CS HOLD UP BATTERY | | | | | | |
| | | | 30.0 | 37.0 | | 3.5 | 1.5 |
| 3 | NAV SYS (1/2 DDG 51) | | | | | | |
| | W420 | UNKNOWN | UNKNOWN | 3.8 | UNKNOWN | 46.0 | 45.9 |
| 2 | EXCOMM (1/2 DDG51) | | | | | | |
| | W440 | 0.0 | 16.0 | 16.0 | UNKNOWN | 21.8 | 21.8 |
| 4 | SPS-67 SSR | | | | | | |
| | W451 | 0.0 | 1.8 | 1.8 | UNKNOWN | 59.5 | 59.5 |
| 6 | MK XII AIMS IFF | | | | | | |
| | W455 | 0.0 | 2.3 | 2.3 | UNKNOWN | 60.0 | 60.0 |
| 5 | SPY-3C (MINI-SPY) | | | | | | |
| | W456 | 0.0 | 18.0 | 18.0 | UNKNOWN | 62.0 | 62.0 |
| 26 | AQS-13F ACTIVE HELO DIPPING SONAR [ON SH | | | | | | |
| | W460 | 14.1 | 0.2 | 14.3 | 25.8 | 30.6 | 25.8 |
| 7 | SQR-19 TACTAS | | | | | | |
| | W462 | 0.0 | 14.1 | 14.1 | UNKNOWN | 25.8 | 25.8 |
| 9 | SLQ-32(V)3 ACTIVE/PASSIVE ECM | | | | | | |
| | W472 | 0.0 | 3.0 | 3.0 | UNKNOWN | 51.0 | 51.0 |
| 8 | SLQ-25 NIXIE | | | | | | |
| | W473 | 0.0 | 3.6 | 3.6 | UNKNOWN | 22.8 | 22.8 |
| 16 | OPER READINESS AND TEST SYS | | | | | | |
| | W491 | 2.6 | 3.0 | | -6.8 | 32.5 | |
| 38 | ADMIN LAN | | | | | | |
| | | | 0.7 | 6.3 | | 30.0 | 33.7 |
| 12 | SENSOR COOLING SYSTEMS | | | | | | |
| | W532 | UNKNOWN | UNKNOWN | 4.0 | UNKNOWN | 10.0 | 47.5 |
| 17 | RAST/TALON HELO COMBO | | | | | | |
| | W588 | 0.0 | 5.0 | | UNKNOWN | 32.8 | |
| 18 | RAST CONTROL STATION | | | | | | |
| | | | 0.0 | 5.0 | | 0.0 | 32.8 |
| 20 | 1X MK45 5IN/54 GUN | | | | | | |
| | W710 | 0.0 | 24.1 | | UNKNOWN | 23.7 | |
| 21 | 1X 40MM CIWS/MULTI PURP GUN | | | | | | |
| | | | 6.1 | | | 34.7 | |
| 22 | 1X 40MM CIWS/MULTI PURP GUN | | | | | | |
| | | | 6.1 | 36.3 | | 32.3 | 27.0 |
| 23 | 1.25 MK41 VLS MISSILE LAUNCHER (LOADED) | | | | | | |
| | W721 | 0.0 | 157.0 | 157.0 | UNKNOWN | 16.7 | 16.7 |
| 25 | 2X MK32 SVTT ON DECK | | | | | | |
| | W750 | 0.0 | 2.7 | 2.7 | UNKNOWN | 2.5 | 2.5 |
| 41 | AIRCRAFT RELATED WEAPONS | | | | | | |
| | W780 | 0.0 | 1.4 | 1.4 | UNKNOWN | 28.3 | 28.3 |
| 28 | 5IN/54 AMMO 400 RDS | | | | | | |
| | WF21 | 0.0 | 22.0 | | UNKNOWN | 9.0 | |
| 29 | 40MM AMMO (MIXED) 3000 RNDS | | | | | | |
| | | | 7.4 | | | 24.7 | |
| 32 | 40MM AMMO (MIXED) -- 3000 RNDS | | | | | | |
| | | | 7.4 | | | -7.0 | |
| 33 | MK46 LIGHTWEIGHT ASW TORPEDOES -- 6 RDS | | | | | | |
| | | | 1.4 | 38.2 | | 3.0 | 8.7 |
| 34 | HELO AS565 PANTHER: (DOLPHIN) | | | | | | |
| | WF23 | 0.0 | 4.4 | 4.4 | UNKNOWN | 5.0 | 5.0 |
| 19 | LAMPS MKIV: AVIATION SUPPORT & SPARES | | | | | | |
| | WF26 | 0.0 | 2.0 | 2.0 | UNKNOWN | 33.8 | 33.8 |
| 37 | LAMPS MKIII: FUEL [JP-5] | | | | | | |
| | WF42 | 0.0 | 63.8 | 63.8 | UNKNOWN | 9.8 | 9.8 |

PRINTED REPORT NO. 11 - P+A WEIGHTS AND VCGS

| ROW | P+A WT KEY | WEIGHT ADD | WEIGHT FAC,LTON | VCG KEY | VCG ADD,FT | VCG FAC |
|---|---|---|---|---|---|---|
| 1 | CIC COMMAND AND DECISION MODFIG | | | | | |
| | W410 | 7.00 | 0.00 | D6.5 | -7.22 | 0.00 |
| 11 | CS HOLD UP BATTERY | | | | | |
| | W410 | 30.00 | 0.00 | BL | 3.50 | 1.00 |
| 3 | NAV SYS (1/2 DDG 51) | | | | | |
| | W420 | 3.80 | -1.00 | D10 | 16.00 | 1.00 |
| 2 | EXCOMM (1/2 DDG51) | | | | | |
| | W440 | 16.00 | 0.00 | D10 | -8.20 | 1.00 |
| 4 | SPS-67 SSR | | | | | |
| | W451 | 1.75 | 0.00 | D10 | 29.50 | 1.00 |
| 6 | MK XII AIMS IFF | | | | | |
| | W455 | 2.30 | 0.00 | D10 | 30.00 | 1.00 |

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  5  SPY-3C (MINI-SPY)
      W456       18.00        0.00       DM10         32.00        1.00
 26  AQS-13F ACTIVE HELO DIPPING SONAR [ON SH
      W460        0.20        0.00       BL           30.56        0.00
  7  SQR-19 TACTAS
      W462       14.10        0.00       D20          -5.00        1.00
  9  SLQ-32(V)3 ACTIVE/PASSIVE ECM
      W472        3.00        0.00       D10          21.00        1.00
  8  SLQ-25 NIXIE
      W473        3.60        0.00       D20          -8.00        1.00
 16  OPER READINESS AND TEST SYS
      W491        3.00        0.00       D10           2.50        1.00
 38  ADMIN LAN
      W491        0.70        0.00       BL           30.00        0.00
 12  SENSOR COOLING SYSTEMS
      W532        4.00       -1.00       BL           10.00        1.00
 17  RAST/TALON HELO COMBO
      W588        5.00        0.00       D20           2.00        1.00
 18  RAST CONTROL STATION
      W588        0.00        0.00       D20           0.00        0.00
 20  1X MK45 5IN/54 GUN
      W710       24.10        0.00       D6.5         -8.00        1.00
 21  1X 40MM CIWS/MULTI PURP GUN
      W710        6.10        0.00       D6.5          3.00        1.00
 22  1X 40MM CIWS/MULTI PURP GUN
      W710        6.10        0.00       D15           3.00        1.00
 23  1.25 MK41 VLS MISSILE LAUNCHER (LOADED)
      W721      157.00        0.00       D6.5        -15.00        1.00
 25  2X MK32 SVTT ON DECK
      W750        2.70        0.00       D15           2.50        0.00
 41  AIRCRAFT RELATED WEAPONS
      W780        1.40        0.00       BL           28.30        0.00
 28  5IN/54 AMMO 400 RDS
      WF21       22.00        0.00       BL            9.00        1.00
 29  40MM AMMO (MIXED) 3000 RNDS
      WF21        7.40        0.00       D6.5         -7.00        1.00
 32  40MM AMMO (MIXED) -- 3000 RNDS
      WF21        7.40        0.00       D15          -7.00        0.00
 33  MK46 LIGHTWEIGHT ASW TORPEDOES -- 6 RDS
      WF21        1.40        0.00       D15           3.00        0.00
 34  HELO AS565 PANTHER: (DOLPHIN)
      WF23        4.40        0.00       D20           5.00        0.00
 19  LAMPS MKIV: AVIATION SUPPORT & SPARES
      WF26        2.00        0.00       D20           3.00        1.00
 37  LAMPS MKIII: FUEL [JP-5]
      WF42       63.80        0.00       BL            9.84        0.00

ASSET/MONOSC VERSION 3.3+ - SPACE MODULE - 2/11/95  10.49.47.

** WARNING - SPACE MODULE ** (W-TOTALAREAINADQ-SPACE)
 THE REQUIRED ARRANGEABLE AREA FOR THE TOTAL SHIP EXCEEDS
 THE AVAILABLE ARRANGEABLE AREA WITHIN THE TOTAL SHIP.

 PRINTED REPORT NO.  1 - SUMMARY

 COLL PROTECT SYSTEM-PRESENT            HAB STANDARD-NAVY
 SONAR DOME-NONE                        UNIT COMMANDER-NONE

 FULL LOAD WT, LTON          3980.1     HAB STANDARD FAC             0.000
 TOTAL CREW ACC               122.      PASSWAY MARGIN FAC           0.000
 HULL AVG DECK HT, FT        10.57      AC MARGIN FAC                0.200
 MR VOLUME, FT3              49678.     SPACE MARGIN FAC             0.050
                                     AREA FT2                  VOL FT3
                          PAYLOAD    TOTAL      TOTAL        TOTAL
                          REQUIRED  REQUIRED  AVAILABLE      ACTUAL
                          --------  --------  ---------     --------
 DKHS ONLY                  891.0    4850.6    10911.7       110686.
 HULL OR DKHS              3505.0   36769.7    29486.0       388003.
                          --------  --------  ---------     --------
 TOTAL                     4396.0   41620.3    40397.7       498689.

                              TOTAL      DKHS     PERCENT
 SSCS    GROUP               AREA FT2  AREA FT2  TOTAL AREA
 -------------               --------  --------  ----------
  1. MISSION SUPPORT          6272.0    1508.5      15.1
  2. HUMAN SUPPORT            7923.7     381.5      19.0
  3. SHIP SUPPORT            12407.7    1651.8      29.8
  4. SHIP MOBILITY SYSTEM    13035.0    1077.8      31.3
  5. UNASSIGNED               1981.9     231.0       4.8
                             --------  --------  ----------
                 TOTAL       41620.3    4850.6     100.0
```

PRINTED REPORT NO. 2 - MISSION SUPPORT AREA

| SSCS | GROUP | TOTAL AREA FT2 | DKHS AREA FT2 |
|---|---|---|---|
| 1. | MISSION SUPPORT | 6272.0 | 1508.5 |
| 1.1 | COMMAND,COMMUNICATION+SURV | 2974.4 | 1305.0 |
| 1.11 | EXTERIOR COMMUNICATIONS | 730.0 | 95.0 |
| *1.111 | RADIO | 730.0 | 95.0 |
| 1.112 | UNDERWATER SYSTEMS | | |
| 1.12 | SURVEILLANCE SYS | 670.0 | 470.0 |
| *1.121 | SURFACE SURV (RADAR) | 670.0 | 470.0 |
| 1.122 | UNDERWATER SURV (SONAR) | | |
| 1.13 | COMMAND+CONTROL | 1008.0 | 608.0 |
| *1.131 | COMBAT INFO CENTER | 400.0 | |
| 1.132 | CONNING STATIONS | 608.0 | 608.0 |
| 1.1321 | PILOT HOUSE | 528.0 | 528.0 |
| 1.1322 | CHART ROOM | 80.0 | 80.0 |
| 1.14 | COUNTERMEASURES | 192.0 | 132.0 |
| *1.141 | ELECTRONIC | 172.0 | 132.0 |
| *1.142 | TORPEDO | 20.0 | |
| 1.143 | MISSILE | | |
| 1.15 | INTERIOR COMMUNICATIONS | 344.1 | |
| 1.16 | ENVIRONMENTAL CNTL SUP SYS | 30.3 | |
| 1.2 | WEAPONS | 1779.0 | 144.0 |
| *1.21 | GUNS | 879.0 | 144.0 |
| *1.22 | MISSILES | 900.0 | |
| 1.23 | ROCKETS | | |
| 1.24 | TORPEDOS | | |
| 1.25 | DEPTH CHARGES | | |
| 1.26 | MINES | | |
| 1.27 | MULT EJECT RACK STOW | | |
| 1.28 | WEAP MODULE STA & SERV INTER | | |
| 1.3 | AVIATION | 625.0 | 50.0 |
| 1.31 | AVIATION LAUNCH+RECOVERY | 25.0 | |
| 1.311 | LAUNCHING+RECOVERY AREAS | | |
| *1.312 | LAUNCHING+RECOVERY EQUIP | 25.0 | |
| 1.32 | AVIATION CONTROL | | |
| 1.321 | FLIGHT CONTROL | | |
| 1.322 | NAVIGATION | | |
| 1.323 | OPERATIONS | | |
| 1.33 | AVIATION HANDLING | | |
| *1.34 | AIRCRAFT STOWAGE | 450.0 | |
| 1.35 | AVIATION ADMINISTRATION | | |
| *1.36 | AVIATION MAINTENANCE | 50.0 | 50.0 |
| 1.37 | AVIATION ORDINANCE | | |
| 1.372 | CONTROL | | |
| 1.373 | HANDLING | | |
| 1.374 | STOWAGE | | |
| 1.38 | AVIATION FUEL SYS | | |
| *1.39 | AVIATION STORES | 100.0 | |
| 1.4 | AMPHIBIOUS | | |
| 1.5 | CARGO | | |
| 1.6 | INTERMEDIATE MAINT FAC | 731.7 | |
| 1.64 | STOWAGE | 731.7 | |
| 1.641 | WEAPONS | 731.7 | |
| 1.7 | FLAG FACILITIES | | |
| 1.73 | HANDLING | | |
| 1.74 | STOWAGE | | |
| 1.8 | SPECIAL MISSIONS | | |
| 1.9 | SM ARMS,PYRO+SALU BAT | 161.9 | 9.5 |
| 1.91 | SM ARMS (LOCKER) | 41.4 | |
| 1.92 | PYROTECHNICS (LOCKER) | 9.5 | 9.5 |
| 1.93 | SALUTING BAT (MAGAZINE) | 14.0 | |
| 1.95 | SECURITY FORCE EQUIP | 97.1 | |

PRINTED REPORT NO. 3 - HUMAN SUPPORT AREA

HAB STD = NAVY

| SSCS | GROUP | TOTAL AREA FT2 | DKHS AREA FT2 |
|---|---|---|---|
| 2. | HUMAN SUPPORT | 7923.7 | 381.5 |
| 2.1 | LIVING | 4403.5 | 340.0 |
| 2.11 | OFFICER LIVING | 1565.0 | 340.0 |
| 2.111 | BERTHING | 1360.0 | 260.0 |
| 2.1111 | SHIP OFFICER | 1360.0 | 260.0 |
| 2.1115 | FLAG OFFICER | | |
| 2.112 | SANITARY | 205.0 | 80.0 |
| 2.1121 | SHIP OFFICER | 205.0 | 80.0 |

| | | | |
|---|---|---|---|
| 2.1125 | FLAG OFFICER | | |
| 2.12 | CPO LIVING | 592.5 | |
| 2.121 | BERTHING | 465.0 | |
| 2.122 | SANITARY | 127.5 | |
| 2.13 | CREW LIVING | 2097.0 | |
| 2.131 | BERTHING | 1800.0 | |
| 2.132 | SANITARY | 297.0 | |
| 2.133 | RECREATION | | |
| 2.1332 | LIBRARY | | |
| 2.14 | GENERAL SANITARY FACILITIES | 110.0 | |
| 2.141 | LADIES RETIRING ROOM | 80.0 | |
| 2.142 | BRIDGE WASHROOM+WC | 15.0 | |
| 2.143 | DECK WASHROOM+WC | 15.0 | |
| 2.15 | SHIP RECREATION FAC | 39.0 | |
| 2.152 | MOTION PIC FILM+EQUIP | 24.4 | |
| 2.153 | PHYSICAL FITNESS | 14.6 | |
| 2.154 | TV ROOM | | |
| 2.16 | TRAINING | | |
| 2.2 | COMMISSARY | 2316.7 | |
| 2.21 | FOOD SERVICE | 1448.0 | |
| 2.211 | OFFICER (MESS+LOUNGE) | 496.6 | |
| 2.212 | CPO (MESS+LOUNGE) | 394.0 | |
| 2.213 | CREW (MESS+LOUNGE) | 557.4 | |
| 2.22 | COMMISSARY SERVICE SPACES | 544.6 | |
| 2.23 | FOOD STORAGE+ISSUE | 324.2 | |
| 2.231 | CHILL PROVISIONS | 79.4 | |
| 2.232 | FROZEN PROVISIONS | 77.7 | |
| 2.233 | DRY PROVISIONS | 167.0 | |
| 2.234 | ISSUE | | |
| 2.3 | MEDICAL+DENTAL (MEDICAL) | 300.0 | |
| 2.4 | GENERAL SERVICES | 523.2 | |
| 2.41 | SHIP STORE FACILITIES | 244.6 | |
| 2.411 | SHIP STORE | 61.0 | |
| 2.416 | SHIP STORE STORES | 183.6 | |
| 2.42 | LAUNDRY FACILITIES | 186.7 | |
| 2.43 | DRY CLEANING | | |
| 2.44 | BARBER SERVICE | 80.0 | |
| 2.46 | POSTAL SERVICE | | |
| 2.47 | BRIG | | |
| 2.48 | RELIGIOUS | 12.0 | |
| 2.5 | PERSONNEL STORES | 150.4 | 41.5 |
| 2.51 | BAGGAGE | 21.4 | |
| 2.52 | MESSROOM STORES | 59.0 | 11.5 |
| 2.55 | FOUL WEATHER GEAR (LOCKER) | 30.0 | 30.0 |
| 2.57 | FOLDING CHAIR STOREROOM | 40.0 | |
| 2.6 | CBR PROTECTION | 209.8 | |
| 2.61 | CBR DECON STATIONS | | |
| 2.62 | CBR DEFENSE EQP STRMS | 209.8 | |
| 2.63 | CPS AIRLOCKS | | |
| 2.7 | LIFESAVING EQUIPMENT | 20.0 | |
| 2.71 | LIFEJACKET LOCKER | 20.0 | |

PRINTED REPORT NO. 4 - SHIP SUPPORT AREA

| SSCS | GROUP | TOTAL AREA FT2 | DKHS AREA FT2 |
|---|---|---|---|
| 3. | SHIP SUPPORT | 12407.7 | 1651.8 |
| 3.1 | SHIP CNTL SYS(STEERING&DIVING) | 564.0 | |
| 3.2 | DAMAGE CONTROL | 375.5 | |
| 3.22 | REPAIR STATIONS | 182.0 | |
| 3.25 | FIRE FIGHTING | 193.5 | |
| 3.3 | SHIP ADMINISTRATION | 972.4 | |
| 3.5 | DECK AUXILIARIES | 696.6 | 212.9 |
| 3.51 | ANCHOR HANDLING | 309.2 | |
| 3.52 | LINE HANDLING | 174.5 | |
| 3.53 | TRANSFER-AT-SEA | 212.9 | 212.9 |
| 3.6 | SHIP MAINTENANCE | 1143.0 | |
| 3.61 | ENGINEERING DEPT | 699.1 | |
| 3.611 | AUX (FILTER CLEANING) | 90.0 | |
| 3.612 | ELECTRICAL | 99.7 | |
| 3.613 | MECH (GENERAL WK SHOP) | 449.3 | |
| 3.614 | PROPULSION MAINTENANCE | 60.0 | |
| 3.62 | OPERATIONS DEPT (ELECT SHOP) | 314.1 | |
| 3.63 | WEAPONS DEPT (ORDINANCE SHOP) | 59.8 | |
| 3.64 | DECK DEPT (CARPENTER SHOP) | 70.0 | |
| 3.7 | STOWAGE | 2173.1 | |
| 3.71 | SUPPLY DEPT | 1640.9 | |
| 3.711 | HAZARDOUS MATL | 146.0 | |
| 3.712 | SPECIAL CLOTHING | 46.1 | |
| 3.713 | GEN USE CONSUM+REPAIR PART | 933.2 | |

| | | | |
|---|---|---|---|
| 3.714 | MISCELLANEOUS | 37.1 | |
| 3.715 | STORES HANDLING | 478.6 | |
| 3.72 | ENGINEERING DEPT | 30.7 | |
| 3.73 | OPERATIONS DEPT | 42.8 | |
| 3.74 | DECK DEPT (BOATSWAIN STORES) | 379.3 | |
| 3.75 | WEAPONS DEPT | 27.3 | |
| 3.76 | EXEC DEPT (MASTER-AT-ARMS STOR) | 31.7 | |
| 3.78 | CLEANING GEAR STOWAGE | 20.5 | |
| 3.8 | ACCESS (INTERIOR-NORMAL) | 6483.0 | 1438.9 |

PRINTED REPORT NO. 5 - SHIP MACHINERY SYSTEM AREA

| SSCS | GROUP | TOTAL AREA FT2 | DKHS AREA FT2 |
|---|---|---|---|
| 4. | SHIP MACHINERY SYSTEM | 13035.0 | 1077.8 |
| 4.1 | PROPULSION SYSTEM | 2421.3 | 390.4 |
| 4.13 | INTERNAL COMBUSTION | 679.3 | 69.6 |
| 4.132 | COMBUSTION AIR | | |
| 4.133 | EXHAUST | 139.3 | 69.6 |
| 4.134 | CONTROL | 540.0 | |
| 4.14 | GAS TURBINE | 1742.0 | 320.7 |
| 4.142 | COMBUSTION AIR | 277.2 | 138.6 |
| 4.143 | EXHAUST | 524.8 | 182.1 |
| 4.144 | CONTROL | 940.0 | |
| 4.17 | AUX PROPULSION SYSTEMS | | |
| 4.2 | PROPULSOR & TRANSMISSION SYST | | |
| 4.3 | AUX MACHINERY | 10613.7 | 687.5 |
| 4.31 | GENERAL (AUX MACH DELTA) | 8419.9 | |
| 4.32 | A/C & REFRIGERATION | 1439.9 | 687.5 |
| 4.321 | A/C (INCL VENT) | 1342.7 | 687.5 |
| 4.322 | REFRIGERATION | 97.2 | |
| 4.33 | ELECTRICAL | 270.1 | |
| 4.331 | POWER GENERATION | 143.1 | |
| 4.3311 | SHIP SERVICE PWR GEN | | |
| 4.3314 | 400 HERTZ | 143.1 | |
| 4.332 | PWR DIST & CNTRL | 2.0 | |
| 4.334 | DEGAUSSING | 125.0 | |
| 4.34 | POLUTION CONTROL SYSTEMS | 134.4 | |
| 4.35 | MECHANICAL SYSTEMS | 349.3 | |

PRINTED REPORT NO. 6 - REQUIRED TANKAGE

POLLUTION CNTRL IND-PRESENT

| | |
|---|---|
| ENDURANCE FUEL, FT3 | 18305. |
| AVIATION FUEL, FT3 | 2814. |
| FRESH WATER, FT3 | 653. |
| SEWAGE, FT3 | 245. |
| WASTE OIL WATER, FT3 | 366. |
| CLEAN BALLAST, FT3 | 0. |
| TANKAGE MARGIN, FT3 | 0. |
| TANKAGE VOL REQ, FT3 | 22382. |

ASSET/MONOSC VERSION 3.3+ - DESIGN SUMMARY - 2/11/95 10.50.12.

PRINTED REPORT NO. 1 - SUMMARY

SHIP COMMENT TABLE

| PRINCIPAL CHARACTERISTICS - FT | |
|---|---|
| LBP | 380.0 |
| LOA | 398.4 |
| BEAM, DWL | 51.0 |
| BEAM, WEATHER DECK | 54.6 |
| DEPTH @ STA 10 | 30.0 |
| DRAFT TO KEEL DWL | 15.5 |
| DRAFT TO KEEL LWL | 15.5 |
| FREEBOARD @ STA 3 | 18.9 |
| GMT | 5.6 |
| CP | 0.570 |
| CX | 0.795 |

SPEED(KT): MAX= 26.1 SUST= 25.0
ENDURANCE: 6000.0 NM AT 14.0 KTS

TRANSMISSION TYPE: ELECT
MAIN ENG: 2 RGT @ 15901.8 HP

SHAFT POWER/SHAFT: 14387.5 HP
PROPELLERS: 2 - FP - 11.7 FT DIA

SEP GEN: 2 D DIESEL @ 2868.0 KW

| | |
|---|---|
| 24 HR LOAD | 1141.9 |
| MAX MARG ELECT LOAD | 2754.9 |

| | OFF | CPO | ENL | TOTAL |
|---|---|---|---|---|
| MANNING | 15 | 13 | 82 | 110 |
| ACCOM | 17 | 15 | 90 | 122 |

| WEIGHT SUMMARY - LTON | |
|---|---|
| GROUP 1 - HULL STRUCTURE | 1320.9 |
| GROUP 2 - PROP PLANT | 281.3 |
| GROUP 3 - ELECT PLANT | 261.7 |
| GROUP 4 - COMM + SURVEIL | 144.9 |
| GROUP 5 - AUX SYSTEMS | 494.2 |
| GROUP 6 - OUTFIT + FURN | 314.0 |
| GROUP 7 - ARMAMENT | 209.6 |
| SUM GROUPS 1-7 | 3026.7 |
| DESIGN MARGIN | 378.3 |
| LIGHTSHIP WEIGHT | 3405.0 |
| LOADS | 575.1 |
| FULL LOAD DISPLACEMENT | 3980.1 |
| FULL LOAD KG: FT | 19.7 |
| MILITARY PAYLOAD WT - LTON | 410.5 |
| USABLE FUEL WT - LTON | 394.3 |

| AREA SUMMARY - FT2 | |
|---|---|
| HULL AREA - | 29486.0 |
| SUPERSTRUCTURE AREA - | 10911.7 |
| TOTAL AREA | 40397.7 |

| VOLUME SUMMARY - FT3 | |
|---|---|
| HULL VOLUME - | 388003.2 |
| SUPERSTRUCTURE VOLUME - | 110685.5 |
| TOTAL VOLUME | 498688.7 |

PRINTED REPORT NO. 2 - MANNING AND ACCOMMODATION SUMMARY

CREW ACCOM MARGIN FAC 0.10

| | SHIPS CREW | AIR DETACH | FLAG STAFF /OTHER | TOTAL MANNING | TOTAL ACCOMMODATION |
|---|---|---|---|---|---|
| OFFICERS | 11. | 4. | 0. | 15. | 17. |
| CPO | 12. | 1. | 0. | 13. | 15. |
| OEM | 76. | 6. | 0. | 82. | 90. |
| TOTAL | 99. | 11. | 0. | 110. | 122. |

PRINTED REPORT NO. 3 - INDICATORS

```
MISSION
  DESIGN MODE IND-ENDURANCE
  ENDUR DISP IND -AVG DISP
  ENDUR DEF IND  -USN
  SUSTN SPEED IND-GIVEN
  ENDUR SPEED IND-GIVEN
HULL FORM FACTORS
  HULL OFFSETS IND-GENERATE
  HULL DIM IND    -B+T
HULL BOUNDARY CONDITIONS
  HULL BC IND    -CONV DD
  HULL STA IND   -OPTIMUM
SHELL APPENDAGES
  BILGE KEEL IND -PRESENT
  SKEG IND       -PRESENT
MARGIN LINE
  MARGIN LINE IND-CALC
HULL SUBDIVISION FACTORS
  HULL SUBDIV IND-CALC
INNER BOTTOM
  INNER BOTTOM IND-PRESENT
HULL LOADS
  HULL LOADS IND -CALC
  SHOCK FNDTN IND-SHOCK
STRUCTURAL ARANGEMENT
  BOT PLATE LIMIT IND-CALC
STIFFENERS
  STIFFENER SHAPE IND-CALC
DKHS GEOM FACTORS
  DKHS GEOM IND  -GENERATE
  DKHS SIZE IND  -AUTO X
DKHS MATERIALS
  DKHS MTRL TYPE IND-HTS
  FIRE PROTECT IND  -NONE
DKHS LOADS
  BLAST RESIST IND-7 PSI
ARRANGEMENT TYPES
  MECH CL ARR IND   -
  MECH PORT ARR IND -
  MECH STBD ARR IND -
  ELECT PG ARR 1 IND-M-PG
  ELECT PG ARR 2 IND-
  ELECT DL ARR IND  -MTR
ARRANGEMENT CG
  MACHY KG IND   -CALC
ENGINE CONFIG FACTORS
  ENG ENDUR RPM IND    -CALC
  SEC ENG USAGE IND    -
  ENDUR CONFIG IND     -NO TS
  GT ENG ENCL IND      -84 DBA
  DIESEL ENG MOUNT IND-COMPOUND
MAIN ENGINES
  MAIN ENG SELECT IND-GIVEN
  MAIN ENG MOD IND -GE-LM1600-VAN2
  MAIN ENG TYPE IND  -RGT
  MAIN ENG SFC EQ IND-POLY QN
  MAIN ENG SIZE IND  -CALC
SEC ENGINES
  SEC ENG SELECT IND -
  SEC ENG MODEL IND  -
  SEC ENG TYPE IND   -
  SEC ENG SFC EQN IND-
  SEC ENG SIZE IND   -
TRANSMISSION FACTORS
  TRANS TYPE IND -ELECT
  TRANS EFF IND  -CALC
ELECTRICAL TRANSMISSION
  ELECT PRPLN TYPE IND  -ACR-DCS
  ELECT PRPLN RATIND IND-CALC
  AC SYNC ROTOR COOL IND-AIR
  TRANS LINE NODE PT IND-CALC
  SWITCHGEAR TYPE IND   -ADV
GEARS
  SEC ENG 2 SPD GEAR IND-
  GEAR IMPED MASS IND    -NONE
PROPULSION SHAFTING
  SHAFT SUPPORT TYPE IND-POD
  SHAFT SYS SIZE IND     -CALC
PROPULSION SHAFT BEARING
  THRUST BRG LOC IND-CALC
PROPELLER FACTORS
  PROP TYPE IND  -FP
  PROP SERIES IND-ANALYTIC
  PROP DIA IND   -CALC
  PROP AREA IND  -CALC
  PROP LOC IND   -CALC
  PITCH RATIO IND-CALC
OPEN WATER PROP DATA
  PROP ID IND    -
PROPULSION SUPPORT SYS
  INLET TYPE IND       -PLENUM
  DUCT SILENCING IND -BOTH
  EXHAUST IR SUPP IND-PRESENT
SS GENERATOR FACTORS
  SS SYS TYPE IND-SEP
  FREQ CONV IND  -
SS GENERATOR SIZE
  SS GEN SIZE IND-NON STD
SS ENGINES
  SS ENG SELECT IND -GIVEN
  SS ENG MODEL IND  -A-12V270
  SS ENG TYPE IND   -D DIESEL
  SS ENG SFC EQN IND-DIESEL
  SS ENG SIZE IND   -CALC
SONAR SYSTEM
  SONAR DOME IND -NONE
  SONAR DRAG IND -
CLIMATE CONTROL

  COLL PROTECT SYS IND-PRESENT
  REFER MACHY LOC IND -OUTSIDE
  AUX BOILER TYPE IND -ELECTRIC
SEA WATER SYSTEMS

AIR AND MISC FLUID SYSTEM

RUDDERS
  RUDDER SIZE IND-CALC
  RUDDER TYPE IND-SPADE
ROLL FINS
  FIN SIZE IND   -CALC
REPLENISHMENT SYSTEMS

SPECIAL PURPOSE SYSTEMS
  POLLUTION CNTL IND-PRESENT
OUTFIT AND FURNISHINGS
  UNIT CMDR IND    -NONE


FUELS AND LUBRICANTS
  SHIP FUEL TYPE IND-JP-5
RESISTANCE FACTORS
  FRICTION LINE IND    -ITTC
  RESID RESIST IND     -NRC
  WORM CURVE IND       -
  PRPLN SYS RESIST IND-CALC
SHIP WEIGHT
  SHIP LCG INPUT IND-CALC
```

PRINTED REPORT NO. 4 - MARGINS

| | |
|---|---|
| HULL | |
| MIN FREEBOARD MARGIN, FT | .25 |
| HULL MARGIN STRESS, KSI | 2.24 |
| PROPULSION PLANT | |
| TORQUE MARGIN FAC | 1.200 |
| ELECTRIC PLANT | |
| ELECT LOAD DES MARGIN FAC | .200 |
| ELECT LOAD SL MARGIN FAC | .100 |
| AUXILIARY SYSTEMS | |
| AC MARGIN FAC | .200 |
| OUTFIT AND FURNISHINGS | |
| CREW ACCOM MARGIN FAC | .100 |
| WEIGHT MARGINS | |
| GROWTH WT MARGIN, LTON | .0 |
| D+B WT MARGIN, LTON | .0 |
| D+B WT MARGIN FAC | .125 |
| D+B KG MARGIN, FT | .00 |
| D+B KG MARGIN FAC | .125 |
| RESISTANCE FACTORS | |
| DRAG MARGIN FAC | .080 |
| SPACE FACTORS | |
| SPACE MARGIN FAC | .050 |
| PASSWAY MARGIN FAC | .000 |
| TANKAGE MARGIN FAC | .000 |

PRINTED REPORT NO. 5 - PAYLOAD AND ADJUSTMENTS

| ROW | PAYLOAD AND ADJUSTMENT NAME |
|---|---|
| 1 | CIC COMMAND AND DECISION MODFIG |
| 2 | EXCOMM (1/2 DDG51) |
| 3 | NAV SYS (1/2 DDG 51) |
| 4 | SPS-67 SSR |
| 5 | SPY-3C (MINI-SPY) |
| 6 | MK XII AIMS IFF |
| 7 | SQR-19 TACTAS |
| 8 | SLQ-25 NIXIE |
| 9 | SLQ-32(V)3 ACTIVE/PASSIVE ECM |
| 11 | CS HOLD UP BATTERY |
| 12 | SENSOR COOLING SYSTEMS |
| 16 | OPER READINESS AND TEST SYS |
| 17 | RAST/TALON HELO COMBO |
| 18 | RAST CONTROL STATION |
| 19 | LAMPS MKIV: AVIATION SUPPORT & SPARES |
| 20 | 1X MK45 5IN/54 GUN |
| 21 | 1X 40MM CIWS/MULTI PURP GUN |
| 22 | 1X 40MM CIWS/MULTI PURP GUN |
| 23 | 1.25 MK41 VLS MISSILE LAUNCHER (LOADED) |
| 24 | LONGITUDNAL BULKHEADS AROUND MAGAZINE |
| 25 | 2X MK32 SVTT ON DECK |
| 26 | AQS-13F ACTIVE HELO DIPPING SONAR [ON SH |
| 28 | 5IN/54 AMMO 400 RDS |
| 29 | 40MM AMMO (MIXED) 3000 RNDS |
| 32 | 40MM AMMO (MIXED) -- 3000 RNDS |
| 33 | MK46 LIGHTWEIGHT ASW TORPEDOES -- 6 RDS |
| 34 | HELO AS565 PANTHER: (DOLPHIN) |
| 37 | LAMPS MKIII: FUEL [JP-5] |
| 38 | ADMIN LAN |
| 41 | AIRCRAFT RELATED WEAPONS |
| 42 | AVIATION STORES |
| 44 | MINE DETECTION HULL MOUNTED SONAR |

PRINTED REPORT NO. 3 - DETAILED MISSION PERFORMANCE

SIG WAVE HT, FT = 0.0
PROBABILITY OF OCCURANCE, PCNT = 1.7

| SPEED KT | PROBABILITY PCNT | DRAG LBF | REQ PROP HP | FUEL CONS NM/LTON |
|---|---|---|---|---|
| 6.0 | 11.9 | 11627. | 330. | 18.0 |
| 14.0 | 46.6 | 55140. | 3600. | 17.5 |
| 20.0 | 35.6 | 110889. | 10349. | 11.3 |
| 25.0 | 4.4 | 211746. | 25441. | 6.1 |
| 26.0 | 1.5 | 250371. | 31804. | 5.0 |

SIG WAVE HT, FT = 4.0
PROBABILITY OF OCCURANCE, PCNT = 15.7

| SPEED KT | PROBABILITY PCNT | DRAG LBF | REQ PROP HP | FUEL CONS NM/LTON |
|---|---|---|---|---|
| 6.0 | 11.9 | 11654. | 331. | 18.0 |
| 14.0 | 46.6 | 55266. | 3609. | 17.4 |
| 20.0 | 35.6 | 111141. | 10375. | 11.2 |
| 25.0 | 4.4 | 212227. | 25507. | 6.1 |
| 26.0 | 1.5 | 250442. | 31804. | 5.0 |

SIG WAVE HT, FT = 6.5
PROBABILITY OF OCCURANCE, PCNT = 11.6

| SPEED KT | PROBABILITY PCNT | DRAG LBF | REQ PROP HP | FUEL CONS NM/LTON |
|---|---|---|---|---|
| 6.0 | 11.9 | 11716. | 333. | 17.9 |
| 14.0 | 46.6 | 55562. | 3630. | 17.4 |
| 20.0 | 35.6 | 111738. | 10436. | 11.2 |
| 25.0 | 4.4 | 213366. | 25663. | 6.1 |
| 26.0 | 1.5 | 250736. | 31804. | 5.0 |

SIG WAVE HT, FT = 10.2
PROBABILITY OF OCCURANCE, PCNT = 42.0

| SPEED KT | PROBABILITY PCNT | DRAG LBF | REQ PROP HP | FUEL CONS NM/LTON |
|---|---|---|---|---|
| 6.0 | 11.9 | 11902. | 339. | 17.9 |
| 14.0 | 46.6 | 56442. | 3694. | 17.2 |
| 20.0 | 35.6 | 113507. | 10619. | 11.0 |
| 25.0 | 4.4 | 216745. | 26129. | 6.0 |
| 25.9 | 1.5 | 251230. | 31804. | 5.0 |

SIG WAVE HT, FT = 17.0
PROBABILITY OF OCCURANCE, PCNT = 29.0

| SPEED KT | PROBABILITY PCNT | DRAG LBF | REQ PROP HP | FUEL CONS NM/LTON |
|---|---|---|---|---|
| 6.0 | 11.9 | 12612. | 362. | 17.7 |
| 14.0 | 46.6 | 59809. | 3938. | 16.5 |
| 20.0 | 35.6 | 120277. | 11326. | 10.4 |
| 25.0 | 4.4 | 229673. | 27930. | 5.6 |
| 25.6 | 1.5 | 253071. | 31804. | 5.0 |

ASSET/MONOSC VERSION 3.3+ - SEAKEEPING ANALYSIS - 2/11/95 10.51.01.

PRINTED REPORT NO. 1 - SUMMARY

APPENDAGE IND-WITH

FULL LOAD WT, LTON 3980.1

| | FULL LOAD |
|---|---|
| BALES RANK | |
| RANK OF THE SYNTHESIZED SHIP (ACTUAL DISP) | 1.975 |
| RANK OF THE SYNTHESIZED SHIP (NORMALIZED) | 2.743 |
| RANK OF THE CLOSEST DATA BASE HULL (NORMALIZED) | 2.730 |
| ID NO OF CLOSEST DATA BASE SHIP | 4 |
| MCCREIGHT RANK | |
| RANK OF THE SYNTHESIZED SHIP (ACTUAL SHIP) | 4.464 |
| RANK OF THE CLOSEST DATA BASE HULL | 4.402 |
| ID NO OF CLOSEST DATA BASE SHIP | 32 |

PRINTED REPORT NO. 2 - SHIP GEOMETRY DATA

FULL LOAD WT, LTON 3980.1

| | FULL LOAD |
|---|---|
| ACTUAL SHIP | |
| LBP, FT | 380.00 |
| BEAM, FT | 50.53 |
| DRAFT, FT | 15.50 |
| VERT PRISMATIC COEF (FWD) | 0.7334 |
| VERT PRISMATIC COEF (AFT) | 0.5414 |
| WATERPLANE COEF (FWD) | 0.5865 |
| WATERPLANE COEF (AFT) | 0.8958 |
| WP AREA AFT MIDSHIPS, FT2 | 8599.97 |
| LCB FROM FP, FT | 197.93 |
| LCF FROM FP, FT | 217.03 |
| BML, FT | 856.32 |
| CUT-UP PT FROM FP, FT | 32.13 |
| NORMALIZED SHIP | |
| DISP, LTON | 4232.1 |
| LBP, FT | 387.86 |
| BEAM, FT | 51.57 |
| DRAFT, FT | 15.82 |
| CUT-UP PT FROM FP, FT | 32.80 |

ASSET/MONOSC VERSION 3.3+ - COST ANALYSIS - 2/11/95 10.51.20.

** WARNING - COST ANALYSIS ** (W-DEFAULTVALUES-CSTMPL)
THE FOLLOWING PARAMETERS WERE PROVIDED DEFAULT VALUES:

| | |
|---|---|
| PAYLOAD T+E COST | LEAD PAYLOAD COST |
| FOLLOW PAYLOAD COST | ANNUAL TRNG ORD COST |
| PAYLOAD FUEL RATE | TECH ADV COST |
| ADDL FACILITY COST | DEFERRED MMHRS REQ |
| UNREP UNIT CAPACITY | UNREP UNIT COST |
| UNREP O+S COST | KN FACTOR ARRAY |
| SHIP FUEL RATE | |

NOTE-THIS INTERIM MODULE PROVIDES GUIDANCE FOR DECISIONS REGARDING SHIP DESIGN TRADEOFFS AND COMPARATIVE EVALUATIONS. REQUESTS FOR ESTIMATES OF SHIP COSTS FOR BUDGETARY PURPOSES SHOULD BE DIRECTED TO NAVSEA.

PRINTED REPORT NO. 1 - SUMMARY

| | | | |
|---|---|---|---|
| YEAR $ | 1995. | NO OF SHIPS ACQUIRED | 100. |
| INFLATION ESCALATION FAC | 1.513 | SERVICE LIFE, YR | 30.0 |
| LEARNING RATE | 0.970 | ANNUAL OPERATING HRS | 3000.0 |
| FUEL COST, $/GAL | 1.000 | MILITARY P/L, LTON | 410.5 |
| PAYLOAD FUEL RATE, LTON/HR | 0.33 | LIGHTSHIP WT, LTON | 3405.0 |
| SHIP FUEL RATE, LTON/HR | 0.92 | FULL LOAD WT, LTON | 3980.1 |

| COST ITEM | COSTS(MILLIONS OF DOLLARS) TOT SHIP | + PAYLOAD | = TOTAL |
|---|---|---|---|
| LEAD SHIP | 529.7 | 223.2* | 752.9 |
| FOLLOW SHIP | 249.9 | 198.6* | 448.6 |
| AVG ACQUISITION COST/SHIP(** SHIPS) | 217.2 | 198.9* | 416.1 |
| LIFE CYCLE COST/SHIP(30 YEARS) | | | 1117.6 |
| TOTAL LIFE CYCLE COST(30 YEARS) | | | 111758.1 |
| DISCOUNTED LIFE CYCLE COST/SHIP | | | 67.4** |
| DISCOUNTED TOTAL LIFE CYCLE COST | | | 6743.3** |

*ESTIMATED VALUE
**DISCOUNTED AT 10 PERCENT

PRINTED REPORT NO. 2 - UNIT ACQUISITION COSTS

| SWBS GROUP | | UNITS | INPUTS | KN FACTORS | LEAD SHIP COSTS $K | FOLLOW SHIP COSTS $K |
|---|---|---|---|---|---|---|
| 100 | HULL STRUCTURE | LTON | 1320.9 | 1.00 | 13179. | 12388. |
| 200 | PROPULSION PLANT | HP | 31803.6 | 2.35 | 28667. | 26947. |
| 300 | ELECTRIC PLANT | LTON | 261.7 | 1.00 | 17999. | 16919. |
| 400 | COMMAND+SURVEILLANCE | LTON | 144.9 | 3.15 | 11157. | 10488. |
| 500 | AUX SYSTEMS | LTON | 494.2 | 1.53 | 28027. | 26345. |
| 600 | OUTFIT+FURNISHINGS | LTON | 314.0 | 1.00 | 13527. | 12715. |
| 700 | ARMAMENT | LTON | 209.6 | 1.00 | 2478. | 2330. |
| | MARGIN | LTON | 378.3 | | 14379. | 13516. |
| 800 | DESIGN+ENGINEERING | | | 26.06 | 197272. | 21798. |
| 900 | CONSTRUCTION SERVICES | | | 4.25 | 34052. | 32009. |
| | TOTAL CONSTRUCTION COST | | | | 360737. | 175455. |
| | CONSTRUCTION COST | | | | 360737. | 175455. |
| | PROFIT(10.0 PERCENT OF CONSTRUCTION COST) | | | | 36074. | 17546. |
| | PRICE | | | | 396811. | 193001. |
| | CHANGE ORDERS(12/8 PERCENT OF PRICE) | | | | 47617. | 15440. |
| | NAVSEA SUPPORT(2.5 PERCENT OF PRICE) | | | | 9920. | 4825. |
| | POST DELIVERY CHARGES(5 PERCENT OF PRICE) | | | | 19841. | 9650. |
| | OUTFITTING(4 PERCENT OF PRICE) | | | | 15872. | 7720. |
| | H/M/E + GROWTH(10 PERCENT OF PRICE) | | | | 39681. | 19300. |
| | TOTAL SHIP COST | | | | 529742. | 249936. |
| | ESTIMATED PAYLOAD COST | | | | 223202. | 198643. |
| | SHIP PLUS PAYLOAD COST | | | | 752944. | 448579. |

| | |
|---|---|
| ADJUSTED FIRST UNIT SHIP COST, $K | 265889.1 |
| COMBAT SYSTEM WEIGHT, LTON | 410.5 |
| PROPULSION SYSTEM WEIGHT, LTON | 281.3 |
| ADJUSTED FIRST UNIT SHIP COST EQUALS FOLLOW SHIP TOTAL COST DIVIDED BY | 0.940 |

PRINTED REPORT NO. 3 - LIFE CYCLE COSTS

| | | | |
|---|---|---|---|
| IOC YEAR | 2010. | PAYLOAD FUEL RATE, LTON/HR | 0.33 |
| R+D PROGRAM LENGTH, YRS | 10. | SHIP FUEL RATE, LTON/HR | 0.92 |
| NUMBER OF SHIPS ACQUIRED | 100. | TECH ADV COST, $M | 0.00 |
| SERVICE LIFE, YRS | 30. | ADDL FACILITY COST, $M | 0.00 |
| NO OF OFFICERS/SHIP | 15. | DEFERRED MMHRS REQ, HR/WK | 0. |
| NO OF ENLISTED MEN/SHIP | 95. | PRODUCTION RATE, SHIPS/YR | 8.00 |

30 - YEAR SYSTEMS COST

(MILLIONS OF YEAR 1995 DOLLARS)

| COST ELEMENT | SHIP NONREC | PAYLOAD NONREC | OTHER NONREC | TOTAL NONREC | SYSTEM RECUR | TOTAL SYSTEM |
|---|---|---|---|---|---|---|
| R+D TOTAL | 594. | 41. | 0. | 634. | | 634. |
| DESIGN+DEVELMNT | 185. | | 0. | 185. | | 185. |
| TEST+EVALUATION | 409. | 41. | 0. | 450. | | 450. |
| INVESTMENT | 23455. | 26452. | 50. | 49958. | | 49958. |
| EQUIPMENT | 22804. | 23867. | | 46670. | | 46670. |
| PRIME | 21718. | 19889. | | 41607. | | 41607. |
| SUPPORT | 1086. | 3978. | | 5064. | | 5064. |
| FACILITIES | | | 0. | 0. | | 0. |
| INITIAL SPARES | 652. | 2586. | | 3237. | | 3237. |
| ASSOCIATED SYS | | | 50. | 50. | | 50. |
| OPERATIONS+SUPPRT | | | | | 63907. | 63907. |
| PERSONNEL | | | | | 6757. | 6757. |
| OPERATIONS | | | | | 6123. | 6123. |
| MAINTENANCE | | | | | 19386. | 19386. |
| ENERGY | | | | | 2827. | 2827. |
| REPL SPARES | | | | | 21041. | 21041. |
| MAJOR SUPPORT | | | | | 7589. | 7589. |
| ASSOCIATED SYS | | | | | 184. | 184. |
| LESS RESIDUAL VALUE | | | | | | 2741. |
| LIFE CYCLE TOTAL SYSTEMS COST | | | | | | 111758. |
| DISCOUNTED AT 10 PERCENT | | | | | | 6743. |

| | |
|---|---|
| COST PER VEHICLE-UNDISCOUNTED | 1118. |
| COST PER VEHICLE-DISCOUNTED | 67. |

ASSET/MONOSC VERSION 3.3+ - MANNING ANALYSIS - 2/11/95 10.51.32.

NOTE-THIS INTERIM MANNING MODEL PROVIDES GROSS TREND ANALYSIS BASED ON HISTORICAL MANNING DATA OF EXISTING SHIPS. REQUESTS FOR SHIP MANNING DETERMINATION SHOULD BE DIRECTED TO NAVSEA.

PRINTED REPORT NO. 1 - SUMMARY

FULL LOAD WT, LTON 3980.1

| | | | |
|---|---|---|---|
| TOTAL MMHRS REQ/WK | 6817.8 | NO WATCH STATIONS | 5. |
| TOTAL MMHRS AVAIL/WK | 5920.0 | NO WATCHSTANDERS | 14. |
| DEFERRED MMHRS/WK | 897.8 | NO NON-WATCHSTANDERS | 74. |

| | OFFICERS | CPO | ENLISTED | TOTAL |
|---|---|---|---|---|
| REQ MANNING | 11. | 11. | 104. | 126. |
| AVAIL MANNING | 15. | 13. | 82. | 110. |
| DIFFERENCE | 4. | 2. | -22. | -16. |
| ACCOMMODATIONS | 17. | 15. | 90. | 122. |

PRINTED REPORT NO. 2 - MANNING AND ACCOMMODATION SUMMARY

CREW ACCOM MARGIN FAC 0.10

| | SHIPS CREW | AIR DETACH | FLAG STAFF /OTHER | ACCOMMODATION |
|---|---|---|---|---|
| OFFICERS | 11. | 4. | 0. | 17. |
| CPO | 12. | 1. | 0. | 15. |
| OEM | 76. | 6. | 0. | 90. |
| TOTAL | 99. | 11. | 0. | 122. |

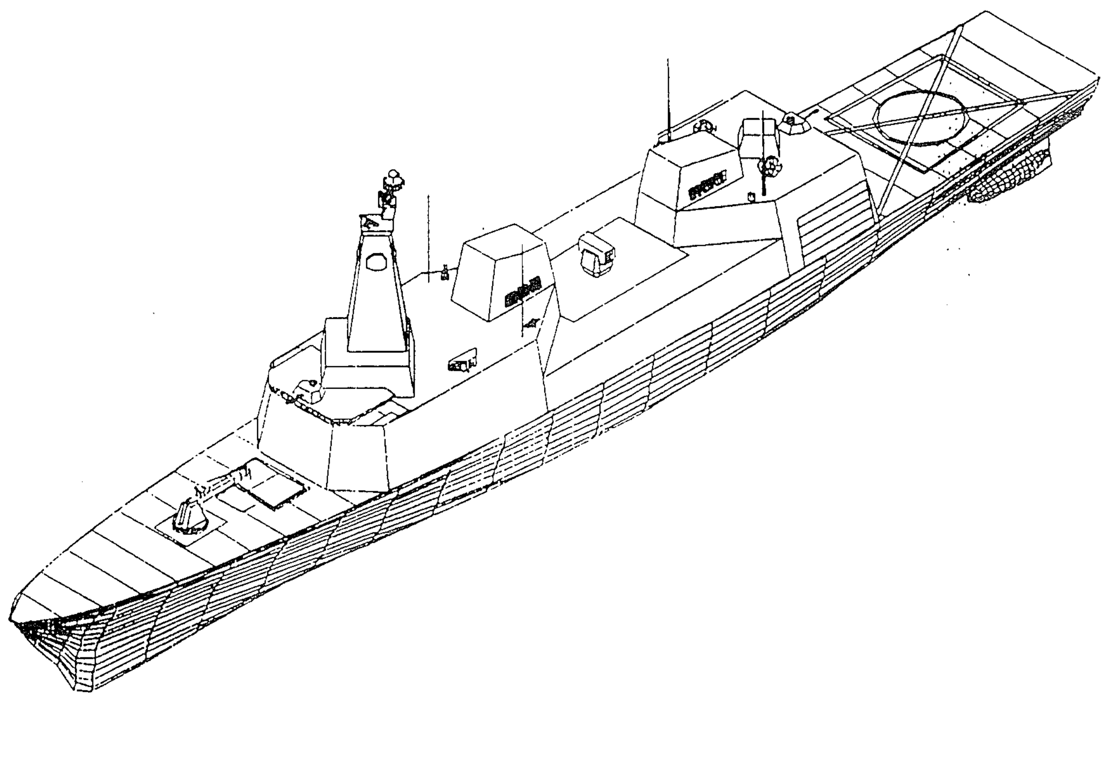
PRINTED REPORT NO. 3 - DEPARTMENTAL MANNING ANALYSIS

| DEPARTMENT | MANNING FACTOR | OFFICERS | CPO | ENLISTED | TOTAL |
|---|---|---|---|---|---|
| CO/EXEC/NAV/MED | 0.7 | 1. | 2. | 10. | 13. |
| OPERATIONS | 0.5 | 1. | 2. | 25. | 28. |
| COMBAT | 0.5 | 2. | 3. | 20. | 25. |
| ENGINEERING | 0.8 | 2. | 2. | 28. | 32. |
| SUPPLY | 0.5 | 1. | 1. | 15. | 17. |
| AVIATION | 1.0 | 4. | 1. | 6. | 11. |
| FLAG STAFF/OTHER | --- | 0. | 0. | 0. | 0. |
| REQ MANNING | | 11. | 11. | 104. | 126. |
| AVAIL MANNING | | 15. | 13. | 82. | 110. |
| DIFFERENCE | | 4. | 2. | -22. | -16. |

PRINTED REPORT NO. 4 - WEEKLY FUNCTIONAL WORKLOAD ANALYSIS

| FUNCTION | WORKLOAD FACTOR | WEEKLY MHRS REQ | WEEKLY MHRS AVAIL | PERCENT |
|---|---|---|---|---|
| OPERATIONAL MANNING (OM) | 0.5 | 2251.4 | | 33.0 |
| PLANNED MAINTENANCE (PM) + CORRECTIVE MAINTENANCE (CM) | 0.5 | 700.9 | | 10.3 |
| OWN UNIT SUPPORT (OUS) | 0.5 | 1368.9 | | 20.1 |
| FACILITY MAINTENANCE (FM) | 0.5 | 488.7 | | 7.2 |
| PRODUCTIVITY ALLOWANCE (PA) | 1.0 | 511.7 | | 7.5 |
| SERVICE DIVERSION ALLOWANCE (SDA) + TRAINING (T) | 1.5 | 1496.2 | | 21.9 |
| TOTAL MMHRS REQ/WK | | 6817.8 | | 100.0 |
| WATCHSTANDERS (74HRS/MAN-WK) | | | 1036.0 | |
| NON-WATCHSTANDERS (66HRS/MAN-WK) | | | 4884.0 | |
| TOTAL MMHRS AVAIL/WK | | | 5920.0 | 86.8 |
| DEFERRED MMHRS/WK | | | 897.8 | 13.2 |

# COAST GUARD VERSION
# ASSET PRINTED REPORT



PRINTED REPORT NO. 1 - HULL GEOMETRY SUMMARY

| | | | |
|---|---|---|---|
| HULL OFFSETS IND-GIVEN | | MIN BEAM, FT | 36.00 |
| HULL DIM IND-GEOSIM | | MAX BEAM, FT | 51.00 |
| MARGIN LINE IND-CALC | | HULL FLARE ANGLE, DEG | |
| HULL STA IND-OPTIMUM | | FORWARD BULWARK, FT | 0.00 |
| HULL BC IND-CONV DD | | | |

HULL PRINCIPAL DIMENSIONS (ON DWL)

| | | | |
|---|---|---|---|
| LBP, FT | 380.00 | PRISMATIC COEF | 0.570 |
| LOA, FT | 398.29 | MAX SECTION COEF | 0.795 |
| BEAM, FT | 51.00 | WATERPLANE COEF | 0.734 |
| BEAM @ WEATHER DECK, FT | 54.54 | LCB/LCP | 0.515 |
| DRAFT, FT | 15.58 | HALF SIDING WIDTH, FT | 1.00 |
| DEPTH STA 0, FT | 37.56 | BOT RAKE, FT | 0.00 |
| DEPTH STA 3, FT | 34.42 | RAISED DECK HT, FT | 0.00 |
| DEPTH STA 10, FT | 30.00 | RAISED DECK FWD LIM, STA | |
| DEPTH STA 20, FT | 30.76 | RAISED DECK AFT LIM, STA | |
| FREEBOARD @ STA 3, FT | 18.84 | BARE HULL DISPL, LTON | 3911.60 |
| STABILITY BEAM, FT | 49.70 | AREA BEAM, FT | 50.13 |

| BARE HULL DATA ON LWL | | STABILITY DATA ON LWL | |
|---|---|---|---|
| LGTH ON WL, FT | 379.79 | KB, FT | 9.31 |
| BEAM, FT | 50.94 | BMT, FT | 16.87 |
| DRAFT, FT | 15.12 | KG, FT | 19.52 |
| FREEBOARD @ STA 3, FT | 19.30 | FREE SURF COR, FT | 0.10 |
| PRISMATIC COEF | 0.564 | SERV LIFE KG ALW, FT | 0.50 |
| MAX SECTION COEF | 0.790 | | |
| WATERPLANE COEF | 0.729 | GMT, FT | 6.06 |
| WATERPLANE AREA, FT2 | 14110.88 | GML, FT | 846.80 |
| WETTED SURFACE, FT2 | 18716.17 | GMT/B AVAIL | 0.119 |
| | | GMT/B REQ | 0.100 |
| BARE HULL DISPL, LTON | 3726.75 | | |
| APPENDAGE DISPL, LTON | 86.61 | | |
| FULL LOAD WT, LTON | 3813.36 | | |

PRINTED REPORT NO. 2 - HULL OFFSETS

STATION NO. 1, AT X = -18.292 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 0.000 | 38.500 |
| 2 | 0.328 | 38.558 |
| 3 | 0.761 | 38.616 |
| 4 | 1.203 | 38.674 |
| 5 | 1.424 | 38.732 |

STATION NO. 2, AT X = -9.146 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 0.000 | 26.746 |
| 2 | 1.197 | 29.594 |
| 3 | 3.303 | 32.442 |
| 4 | 5.770 | 35.290 |
| 5 | 7.923 | 38.138 |

STATION NO. 3, AT X = 0.000 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 0.128 | 15.581 |
| 2 | 1.447 | 21.076 |
| 3 | 3.875 | 26.572 |
| 4 | 7.000 | 32.068 |
| 5 | 10.410 | 37.564 |

STATION NO. 4, AT X = 6.537 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 0.000 | 4.563 |
| 2 | 0.005 | 4.574 |
| 3 | 0.050 | 4.652 |
| 4 | 0.173 | 4.861 |
| 5 | 0.381 | 5.269 |
| 6 | 0.633 | 5.941 |
| 7 | 0.845 | 6.943 |
| 8 | 0.938 | 8.342 |
| 9 | 0.902 | 10.204 |
| 10 | 0.862 | 12.595 |
| 11 | 1.121 | 15.581 |
| 12 | 2.646 | 20.977 |
| 13 | 5.176 | 26.373 |
| 14 | 8.387 | 31.769 |
| 15 | 11.953 | 37.166 |

STATION NO. 5, AT X = 13.074 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 0.000 | 0.000 |
| 2 | 0.018 | 0.016 |
| 3 | 0.100 | 0.125 |
| 4 | 0.245 | 0.421 |
| 5 | 0.447 | 0.997 |
| 6 | 0.675 | 1.948 |
| 7 | 0.884 | 3.365 |
| 8 | 1.044 | 5.344 |
| 9 | 1.187 | 7.977 |
| 10 | 1.454 | 11.358 |
| 11 | 2.133 | 15.581 |
| 12 | 3.833 | 20.880 |
| 13 | 6.448 | 26.179 |
| 14 | 9.724 | 31.478 |
| 15 | 13.407 | 36.777 |

STATION NO. 6, AT X = 32.191 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 0.753 | 0.000 |
| 2 | 0.779 | 0.016 |
| 3 | 0.890 | 0.125 |
| 4 | 1.075 | 0.421 |
| 5 | 1.332 | 0.997 |
| 6 | 1.660 | 1.948 |
| 7 | 2.059 | 3.365 |
| 8 | 2.541 | 5.344 |
| 9 | 3.152 | 7.977 |
| 10 | 3.993 | 11.358 |
| 11 | 5.236 | 15.581 |
| 12 | 7.279 | 20.610 |
| 13 | 10.039 | 25.639 |
| 14 | 13.381 | 30.668 |
| 15 | 17.170 | 35.697 |

STATION NO. 7, AT X = 51.309 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 0.000 |
| 2 | 1.039 | 0.016 |
| 3 | 1.215 | 0.125 |
| 4 | 1.534 | 0.421 |
| 5 | 2.012 | 0.997 |
| 6 | 2.659 | 1.948 |
| 7 | 3.472 | 3.365 |
| 8 | 4.442 | 5.344 |
| 9 | 5.576 | 7.977 |
| 10 | 6.912 | 11.358 |
| 11 | 8.526 | 15.581 |
| 12 | 10.689 | 20.361 |
| 13 | 13.438 | 25.141 |
| 14 | 16.661 | 29.921 |
| 15 | 20.246 | 34.701 |

STATION NO. 8, AT X = 70.427 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 0.000 |
| 2 | 1.059 | 0.016 |
| 3 | 1.338 | 0.125 |
| 4 | 1.874 | 0.421 |
| 5 | 2.704 | 0.997 |
| 6 | 3.827 | 1.948 |
| 7 | 5.198 | 3.365 |
| 8 | 6.740 | 5.344 |
| 9 | 8.381 | 7.977 |
| 10 | 10.089 | 11.358 |
| 11 | 11.879 | 15.581 |
| 12 | 13.977 | 20.133 |
| 13 | 16.572 | 24.685 |
| 14 | 19.523 | 29.237 |
| 15 | 22.691 | 33.790 |

STATION NO. 9, AT X = 89.544 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 0.000 |
| 2 | 1.090 | 0.016 |
| 3 | 1.514 | 0.125 |
| 4 | 2.332 | 0.421 |
| 5 | 3.590 | 0.997 |
| 6 | 5.263 | 1.948 |
| 7 | 7.235 | 3.365 |
| 8 | 9.333 | 5.344 |
| 9 | 11.396 | 7.977 |
| 10 | 13.327 | 11.358 |
| 11 | 15.122 | 15.581 |
| 12 | 17.019 | 19.926 |
| 13 | 19.344 | 24.271 |
| 14 | 21.917 | 28.617 |
| 15 | 24.563 | 32.962 |

STATION NO. 10, AT X = 108.662 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 0.000 |
| 2 | 1.136 | 0.016 |
| 3 | 1.761 | 0.125 |
| 4 | 2.929 | 0.421 |
| 5 | 4.673 | 0.997 |
| 6 | 6.927 | 1.948 |
| 7 | 9.487 | 3.365 |
| 8 | 12.072 | 5.344 |
| 9 | 14.430 | 7.977 |
| 10 | 16.425 | 11.358 |
| 11 | 18.083 | 15.581 |
| 12 | 19.699 | 19.740 |

| | | |
|---|---|---|
| 13 | 21.676 | 23.900 |
| 14 | 23.815 | 28.060 |
| 15 | 25.916 | 32.219 |

STATION NO. 11, AT X = 127.779 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 0.000 |
| 2 | 1.199 | 0.016 |
| 3 | 2.078 | 0.125 |
| 4 | 3.644 | 0.421 |
| 5 | 5.894 | 0.997 |
| 6 | 8.703 | 1.948 |
| 7 | 11.778 | 3.365 |
| 8 | 14.740 | 5.344 |
| 9 | 17.260 | 7.977 |
| 10 | 19.190 | 11.358 |
| 11 | 20.624 | 15.581 |
| 12 | 21.929 | 19.576 |
| 13 | 23.525 | 23.570 |
| 14 | 25.217 | 27.565 |
| 15 | 26.808 | 31.560 |

STATION NO. 12, AT X = 146.897 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 0.000 |
| 2 | 1.265 | 0.016 |
| 3 | 2.402 | 0.125 |
| 4 | 4.355 | 0.421 |
| 5 | 7.070 | 0.997 |
| 6 | 10.365 | 1.948 |
| 7 | 13.864 | 3.365 |
| 8 | 17.099 | 5.344 |
| 9 | 19.684 | 7.977 |
| 10 | 21.475 | 11.358 |
| 11 | 22.655 | 15.581 |
| 12 | 23.660 | 19.432 |
| 13 | 24.880 | 23.283 |
| 14 | 26.148 | 27.135 |
| 15 | 27.294 | 30.986 |

STATION NO. 13, AT X = 166.015 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 0.000 |
| 2 | 1.305 | 0.016 |
| 3 | 2.610 | 0.125 |
| 4 | 4.838 | 0.421 |
| 5 | 7.913 | 0.997 |
| 6 | 11.606 | 1.948 |
| 7 | 15.461 | 3.365 |
| 8 | 18.922 | 5.344 |
| 9 | 21.544 | 7.977 |
| 10 | 23.191 | 11.358 |
| 11 | 24.142 | 15.581 |
| 12 | 24.886 | 19.309 |
| 13 | 25.760 | 23.038 |
| 14 | 26.646 | 26.767 |
| 15 | 27.430 | 30.496 |

STATION NO. 14, AT X = 185.132 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 0.000 |
| 2 | 1.311 | 0.016 |
| 3 | 2.660 | 0.125 |
| 4 | 4.999 | 0.421 |
| 5 | 8.267 | 0.997 |
| 6 | 12.210 | 1.948 |
| 7 | 16.321 | 3.365 |
| 8 | 19.973 | 5.344 |
| 9 | 22.671 | 7.977 |

| | | |
|---|---|---|
| 10 | 24.269 | 11.358 |
| 11 | 25.097 | 15.581 |
| 12 | 25.664 | 19.208 |
| 13 | 26.280 | 22.835 |
| 14 | 26.888 | 26.463 |
| 15 | 27.430 | 30.090 |

STATION NO. 15, AT X = 204.250 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 0.000 |
| 2 | 1.310 | 0.016 |
| 3 | 2.650 | 0.125 |
| 4 | 4.970 | 0.421 |
| 5 | 8.210 | 0.997 |
| 6 | 12.137 | 1.948 |
| 7 | 16.273 | 3.365 |
| 8 | 20.018 | 5.344 |
| 9 | 22.875 | 7.977 |
| 10 | 24.653 | 11.358 |
| 11 | 25.569 | 15.581 |
| 12 | 26.062 | 19.127 |
| 13 | 26.534 | 22.674 |
| 14 | 26.989 | 26.221 |
| 15 | 27.430 | 29.768 |

STATION NO. 16, AT X = 226.219 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 0.259 |
| 2 | 1.260 | 0.275 |
| 3 | 2.422 | 0.382 |
| 4 | 4.522 | 0.673 |
| 5 | 7.563 | 1.240 |
| 6 | 11.359 | 2.174 |
| 7 | 15.476 | 3.569 |
| 8 | 19.339 | 5.514 |
| 9 | 22.439 | 8.104 |
| 10 | 24.507 | 11.428 |
| 11 | 25.604 | 15.581 |
| 12 | 26.112 | 19.061 |
| 13 | 26.569 | 22.542 |
| 14 | 27.000 | 26.022 |
| 15 | 27.430 | 29.503 |

STATION NO. 17, AT X = 248.188 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 1.090 |
| 2 | 1.161 | 1.104 |
| 3 | 1.993 | 1.206 |
| 4 | 3.751 | 1.481 |
| 5 | 6.562 | 2.017 |
| 6 | 10.285 | 2.901 |
| 7 | 14.469 | 4.220 |
| 8 | 18.488 | 6.060 |
| 9 | 21.767 | 8.509 |
| 10 | 23.992 | 11.654 |
| 11 | 25.196 | 15.581 |
| 12 | 25.812 | 19.023 |
| 13 | 26.398 | 22.464 |
| 14 | 26.942 | 25.906 |
| 15 | 27.430 | 29.348 |

STATION NO. 18, AT X = 270.156 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 2.520 |
| 2 | 1.102 | 2.533 |
| 3 | 1.723 | 2.624 |
| 4 | 3.221 | 2.872 |
| 5 | 5.788 | 3.356 |
| 6 | 9.321 | 4.152 |

| | | |
|---|---|---|
| 7 | 13.397 | 5.341 |
| 8 | 17.403 | 7.000 |
| 9 | 20.756 | 9.207 |
| 10 | 23.109 | 12.041 |
| 11 | 24.423 | 15.581 |
| 12 | 25.217 | 19.012 |
| 13 | 26.037 | 22.443 |
| 14 | 26.791 | 25.874 |
| 15 | 27.390 | 29.306 |

STATION NO. 19, AT X = 292.125 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 4.492 |
| 2 | 1.069 | 4.503 |
| 3 | 1.559 | 4.580 |
| 4 | 2.852 | 4.791 |
| 5 | 5.162 | 5.201 |
| 6 | 8.424 | 5.878 |
| 7 | 12.270 | 6.887 |
| 8 | 16.141 | 8.295 |
| 9 | 19.484 | 10.169 |
| 10 | 21.923 | 12.575 |
| 11 | 23.318 | 15.581 |
| 12 | 24.303 | 19.029 |
| 13 | 25.335 | 22.477 |
| 14 | 26.273 | 25.925 |
| 15 | 26.978 | 29.374 |

STATION NO. 20, AT X = 314.094 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 6.865 |
| 2 | 1.050 | 6.874 |
| 3 | 1.446 | 6.935 |
| 4 | 2.557 | 7.100 |
| 5 | 4.596 | 7.423 |
| 6 | 7.533 | 7.955 |
| 7 | 11.069 | 8.748 |
| 8 | 14.723 | 9.854 |
| 9 | 17.987 | 11.327 |
| 10 | 20.458 | 13.219 |
| 11 | 21.874 | 15.581 |
| 12 | 23.057 | 19.074 |
| 13 | 24.275 | 22.567 |
| 14 | 25.366 | 26.060 |
| 15 | 26.170 | 29.553 |

STATION NO. 21, AT X = 336.063 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 9.442 |
| 2 | 1.037 | 9.449 |
| 3 | 1.358 | 9.492 |
| 4 | 2.293 | 9.608 |
| 5 | 4.044 | 9.835 |
| 6 | 6.614 | 10.210 |
| 7 | 9.780 | 10.768 |
| 8 | 13.149 | 11.548 |
| 9 | 16.268 | 12.585 |
| 10 | 18.707 | 13.917 |
| 11 | 20.069 | 15.581 |
| 12 | 21.470 | 19.146 |
| 13 | 22.874 | 22.712 |
| 14 | 24.115 | 26.278 |
| 15 | 25.025 | 29.844 |

STATION NO. 22, AT X = 358.031 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 12.012 |
| 2 | 1.028 | 12.016 |
| 3 | 1.285 | 12.041 |

| | | |
|---|---|---|
| 4 | 2.046 | 12.108 |
| 5 | 3.497 | 12.241 |
| 6 | 5.668 | 12.458 |
| 7 | 8.416 | 12.783 |
| 8 | 11.445 | 13.236 |
| 9 | 14.358 | 13.839 |
| 10 | 16.699 | 14.613 |
| 11 | 17.931 | 15.581 |
| 12 | 19.575 | 19.247 |
| 13 | 21.177 | 22.914 |
| 14 | 22.574 | 26.580 |
| 15 | 23.602 | 30.247 |

STATION NO. 23, AT X = 380.000 FT

| POINT | HALF BEAM,FT | WATERLINE,FT |
|---|---|---|
| 1 | 1.000 | 14.387 |
| 2 | 1.024 | 14.388 |
| 3 | 1.231 | 14.396 |
| 4 | 1.834 | 14.419 |
| 5 | 2.988 | 14.463 |
| 6 | 4.753 | 14.536 |
| 7 | 7.066 | 14.645 |
| 8 | 9.727 | 14.796 |
| 9 | 12.401 | 14.998 |
| 10 | 14.600 | 15.257 |
| 11 | 15.646 | 15.581 |
| 12 | 17.535 | 19.375 |
| 13 | 19.303 | 23.170 |
| 14 | 20.821 | 26.965 |
| 15 | 21.961 | 30.760 |

PRINTED REPORT NO. 3 - HULL BOUNDARY CONDITIONS

HULL OFFSETS IND-GIVEN

PRINTED REPORT NO. 4 - MARGIN LINE

MARGIN LINE IND-CALC
MIN FREEBOARD MARGIN, FT 0.25

| DIST FROM FP FT | HT ABOVE BL FT |
|---|---|
| -18.29 | 38.48 |
| -9.15 | 37.89 |
| 0.00 | 37.31 |
| 6.54 | 36.92 |
| 13.07 | 36.53 |
| 32.19 | 35.45 |
| 51.31 | 34.45 |
| 70.43 | 33.54 |
| 89.54 | 32.71 |
| 108.66 | 31.97 |
| 127.78 | 31.31 |
| 146.90 | 30.74 |
| 166.01 | 30.25 |
| 185.13 | 29.84 |
| 204.25 | 29.52 |
| 226.22 | 29.25 |
| 248.19 | 29.10 |
| 270.16 | 29.06 |
| 292.13 | 29.12 |
| 314.09 | 29.30 |
| 336.06 | 29.59 |
| 358.03 | 30.00 |
| 380.00 | 30.51 |

```
PRINTED REPORT NO. 5 - HULL SECTIONAL AREA CURVE

STATION    LOCATION,FT   AREA,FT2
   1         -18.29        0.00
   2          -9.15        0.00
   3           0.00        0.00
   4           6.54       18.36
   5          13.07       37.27
   6          32.19       97.35
   7          51.31      165.96
   8          70.43      242.37
   9          89.54      323.58
  10         108.66      405.02
  11         127.78      481.29
  12         146.90      546.74
  13         166.01      596.17
  14         185.13      625.33
  15         204.25      631.35
  16         226.22      608.36
  17         248.19      554.94
  18         270.16      475.99
  19         292.13      379.48
  20         314.09      275.69
  21         336.06      175.87
  22         358.03       90.37
  23         380.00       26.16
C,E>RUN,HULL SUB
COMMAND STRING IS:
  RUN,HULL SUBDIV MODULE

  ASSET/MONOSC VERSION 3.3+ - HULL SUBDIV MODULE - 2/11/95  10.57.05.

PRINTED REPORT NO. 1 - SUMMARY

HULL SUBDIV IND-CALC                     INNER BOT IND-PRESENT
SHAFT SUPPORT TYPE IND-POD

LBP, FT                        380.00    HULL AVG DECK HT, FT        10.57
DEPTH STA 10, FT                30.00
                                         NO INTERNAL DECKS               2
HULL VOLUME, FT3              387374.    NO TRANS BHDS                  13
MR VOLUME, FT3                 48700.    NO LONG BHDS                    0
TANKAGE VOL REQ, FT3           28195.    NO MACHY RMS                    2
EXCESS TANKAGE, FT3             1775.    NO PROP SHAFTS                  2

ARR AREA LOST TANKS, FT2       32.2
HULL ARR AREA AVAIL, FT2    29531.5

PRINTED REPORT NO. 2 - TRANSVERSE BULKHEADS

HULL SUBDIV IND-CALC
NO TRANS BHDS                     13
TRANS BHD SPACING(/LBP)        0.077

BULKHEAD    DISTANCE     DISTANCE     MR FWD
   NO      FROM FP,FT   FROM FP/LBP   BHD LOC
========   ==========   ===========   ========
    1         19.00        0.050
    2         42.76        0.113
    3         66.53        0.175
    4         90.29        0.238
    5        114.06        0.300
    6        137.82        0.363        MMR
    7        172.65        0.454
    8        201.91        0.531
```

| | | | |
|---|---|---|---|
| 9 | 231.17 | 0.608 | MMR |
| 10 | 266.00 | 0.700 | |
| 11 | 294.50 | 0.775 | |
| 12 | 323.00 | 0.850 | |
| 13 | 351.50 | 0.925 | |

PRINTED REPORT NO. 3 - LONGITUDINAL BULKHEADS

NO LONG BHDS 0

PRINTED REPORT NO. 4 - INTERNAL DECKS AND INNER BOTTOM

HULL SUBDIV IND-CALC

INNER BOT IND-PRESENT

| | |
|---|---|
| NO INTERNAL DECKS | 2 |
| DEPTH STA 10, FT | 30.00 |
| HULL AVG DECK HT, FT | 10.57 |
| RAISED DECK HT, FT | 0.00 |

--------- INNER BOTTOM ----------

| | |
|---|---|
| CVK HT, FT | 4.50 |
| HORZ OFFSET HT, FT | |
| HORZ OFFSET, FT | |
| FLAT FWD LOC, FT | 19.00 |
| FLAT AFT LOC, FT | 292.20 |
| OFFSET FWD LOC, FT | |
| OFFSET AFT LOC, FT | |

| INT DECK NO | DIST FROM BL AT .5 LBP,FT | DECK SHEER FRAC |
|---|---|---|
| 1 | 20.00 | 1.0 |
| 2 | 12.25 | 0.0 |
| IB | 4.50 | |

| INT DECK NO | AVL ARR AREA FT2 | AVL ARR VOL FT3 | USABLE TANKAGE FT3 | VOIDS FT3 | ARR AREA LOST TO TANKS,FT2 |
|---|---|---|---|---|---|
| 1 | 15889.8 | 174243. | 0. | 0. | 0.0 |
| 2 | 9391.9 | 92645. | 602. | 307. | 0.0 |
| IB | 4249.8 | 45361. | 245. | 0. | 32.2 |
| HOLD | | | 29123. | 56. | |
| TOTAL | 29531.5 | 312250. | 29970. | 363. | 32.2 |

PRINTED REPORT NO. 5 - LARGE OBJECT SPACES

SHAFT SUPPORT TYPE IND-POD

| | |
|---|---|
| FOREPEAK VOID VOL, FT3 | 363. |
| FOREPEAK TANKAGE, FT3 | 727. |
| CHAIN LOCKER VOL, FT3 | 1090. |
| SEWAGE VOL REQ, FT3 | 245. |
| SHAFT ALLEY VOL, FT3 | 0. |
| ADDED STEER GEAR VOL, FT3 | 4981. |
| MR AFT BHD POS, FT | 266.00 |
| INNER BOT VOL, FT3 | 17460. |

| MR NO | TYPE | FWD BHD ID | UPR DECK ID | LGTH AVL FT | LGTH RQD FT | HT AVL FT | HT RQD FT | MR VOL FT3 | INNER BOT VOL FT3 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | MMR | 6 | 1 | 34.83 | 34.83 | 20.00 | 19.58 | 24964. | 3452. |
| 2 | MMR | 9 | 1 | 34.83 | 34.83 | 20.00 | 19.58 | 23737. | 2159. |
| | | | | | | | TOTAL | 48700. | 5611. |

PRINTED REPORT NO. 6 - HULL COMPARTMENT ARRANGEABLE AREA

NUMBER OF INTERNAL DECKS - 2
NUMBER OF TRANSVERSE BULKHEADS - 13
INNER BOTTOM INDICATOR - PRESENT

AREAS FOR EACH HULL COMPARTMENT:

| DECK HT, FT ABL | 20.0 | 12.3 | 4.5 |
|---|---|---|---|
| COMP 1, FT2 | 283.0 | | |
| COMP 2, FT2 | 467.9 | 193.2 | 107.2 |
| COMP 3, FT2 | 649.4 | 372.1 | 209.3 |
| COMP 4, FT2 | 813.4 | 563.7 | 337.1 |
| COMP 5, FT2 | 955.0 | 752.0 | 484.2 |
| COMP 6, FT2 | 1069.3 | 917.6 | 633.8 |
| COMP 7, FT2 | 1711.2 | MMR | MMR |
| COMP 8, FT2 | 1511.7 | 1437.7 | 1084.9 |
| COMP 9, FT2 | 1532.0 | 1458.7 | 1055.4 |
| COMP 10, FT2 | 1799.6 | MMR | MMR |
| COMP 11, FT2 | 1419.1 | 1284.9 | 370.1 |
| COMP 12, FT2 | 1340.4 | 1136.5 | |
| COMP 13, FT2 | 1233.2 | 833.2 | |
| COMP 14, FT2 | 1104.6 | 442.3 | |

C,E>RUN,DECKHOUS
COMMAND STRING IS:
RUN,DECKHOUSE MODULE

ASSET/MONOSC VERSION 3.3+ - DECKHOUSE MODULE - 2/11/95 10.58.49.

PRINTED REPORT NO. 1 - DECKHOUSE SUMMARY

DKHS GEOM IND-GENERATE
DKHS SIZE IND-AUTO X
DKHS MTRL TYPE IND-HTS

BLAST RESIST IND-7 PSI
FIRE PROTECT IND-NONE

| | | | |
|---|---|---|---|
| LBP, FT | 380.00 | DKHS LENGTH OA, FT | 188.81 |
| BEAM, FT | 51.00 | DKHS MAX WIDTH, FT | 54.91 |
| AREA BEAM, FT | 50.13 | DKHS HT (W/O PLTHS), FT | 42.55 |
| DKHS FWD LIMIT- STA | 4.0 | OTHER ARR AREA REQ, FT2 | 34896.52 |
| DKHS AFT LIMIT- STA | 13.9 | HULL ARR AREA AVAIL, FT2 | 29531.47 |
| DKHS AVG DECK HT, FT | 9.84 | DKHS ARR AREA REQ, FT2 | 4849.69 |
| DKHS NO LVLS | 2 | HANGER ARR AREA REQ, FT2 | 0.00 |
| DKHS AVG SIDE CLR, FT | .00 | PLTHS ARR AREA REQ, FT2 | 608.00 |
| DKHS AVG SIDE ANG, DEG | 10.00 | | |
| DKHS NO PRISMS | 20 | DKHS MAX ARR AREA, FT2 | 10908.19 |
| DKHS ARR AREA DERIV, FT2 | 220.13 | DKHS ARR AREA AVAIL, FT2 | 10307.76 |
| DKHS MIN ALW BEAM, FT | 20.73 | DKHS VOLUME, FT3 | 104558.43 |
| BRIDGE L-O-S OVER BOW, FT | 247.57 | | |
| | | DKHS WEIGHT, LTON | 200.97 |
| DKHS SIDE CLR OFFSET, FT | | DKHS VCG, FT | 36.41 |
| DKHS SIDE ANG OFFSET, DEG | | | |
| DKHS DECK HT OFFSET, FT | | | |

PRINTED REPORT NO. 2 - SUPERSTRUCTURE DECKHOUSES

| | |
|---|---|
| NO OF SS DECKHOUSE BLKS | 20 |
| DKHS VOLUME, FT3 | 104558. |
| DKHS ARR AREA AVAIL, FT2 | 10307.8 |

| | DECKHOUSE NUMBER | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| DIST FROM BOW, FT | 76.00 | 85.94 | 95.88 | 105.81 | 115.75 |
| LENGTH, FT | 9.94 | 9.94 | 9.94 | 9.94 | 9.94 |
| DIST FROM CL, FT | | | | | |
| FWD/PORT/BTM | -23.30 | -24.25 | -25.06 | -25.74 | -26.30 |
| AFT/PORT/BTM | -24.25 | -25.06 | -25.74 | -26.30 | -26.73 |
| FWD/STBD/BTM | 23.30 | 24.25 | 25.06 | 25.74 | 26.30 |
| AFT/STBD/BTM | 24.25 | 25.06 | 25.74 | 26.30 | 26.73 |
| FWD/PORT/TOP | -21.56 | -22.52 | -23.33 | -24.01 | -24.57 |
| AFT/PORT/TOP | -22.52 | -23.33 | -24.01 | -24.57 | -25.00 |
| FWD/STBD/TOP | 21.56 | 22.52 | 23.33 | 24.01 | 24.57 |
| AFT/STBD/TOP | 22.52 | 23.33 | 24.01 | 24.57 | 25.00 |
| DIST ABV BASELINE FWD, FT | 33.54 | 33.11 | 32.71 | 32.32 | 31.97 |
| DIST ABV BASELINE AFT, FT | 33.11 | 32.71 | 32.32 | 31.97 | 31.63 |
| HEIGHT, FT | 9.84 | 9.84 | 9.84 | 9.84 | 9.84 |
| VOLUME, FT3 | 4579. | 4750. | 4893. | 5011. | 5104. |
| ARR AREA, FT2 | 446.4 | 463.6 | 478.1 | 490.1 | 499.8 |

| | DECKHOUSE NUMBER | | | | |
|---|---|---|---|---|---|
| | 6 | 7 | 8 | 9 | 10 |
| DIST FROM BOW, FT | 125.69 | 135.63 | 145.56 | 155.50 | 165.44 |
| LENGTH, FT | 9.94 | 9.94 | 9.94 | 9.94 | 9.94 |
| DIST FROM CL, FT | | | | | |
| FWD/PORT/BTM | -26.73 | -27.05 | -27.27 | -27.40 | -27.43 |
| AFT/PORT/BTM | -27.05 | -27.27 | -27.40 | -27.43 | -27.43 |
| FWD/STBD/BTM | 26.73 | 27.05 | 27.27 | 27.40 | 27.43 |
| AFT/STBD/BTM | 27.05 | 27.27 | 27.40 | 27.43 | 27.43 |
| FWD/PORT/TOP | -25.00 | -25.31 | -25.54 | -25.66 | -25.70 |
| AFT/PORT/TOP | -25.31 | -25.54 | -25.66 | -25.70 | -25.69 |
| FWD/STBD/TOP | 25.00 | 25.31 | 25.54 | 25.66 | 25.70 |
| AFT/STBD/TOP | 25.31 | 25.54 | 25.66 | 25.70 | 25.69 |
| DIST ABV BASELINE FWD, FT | 31.63 | 31.31 | 31.02 | 30.75 | 30.51 |
| DIST ABV BASELINE AFT, FT | 31.31 | 31.02 | 30.75 | 30.51 | 30.29 |
| HEIGHT, FT | 9.84 | 9.84 | 9.84 | 9.84 | 9.84 |
| VOLUME, FT3 | 5172. | 5220. | 5248. | 5258. | 5255. |
| ARR AREA, FT2 | 507.1 | 512.3 | 515.7 | 517.3 | 517.6 |

| | DECKHOUSE NUMBER | | | | |
|---|---|---|---|---|---|
| | 11 | 12 | 13 | 14 | 15 |
| DIST FROM BOW, FT | 175.38 | 185.31 | 195.25 | 205.19 | 215.13 |
| LENGTH, FT | 9.94 | 9.94 | 9.94 | 9.94 | 9.94 |
| DIST FROM CL, FT | | | | | |
| FWD/PORT/BTM | -27.43 | -27.43 | -27.43 | -27.43 | -27.43 |
| AFT/PORT/BTM | -27.43 | -27.43 | -27.43 | -27.43 | -27.43 |
| FWD/STBD/BTM | 27.43 | 27.43 | 27.43 | 27.43 | 27.43 |
| AFT/STBD/BTM | 27.43 | 27.43 | 27.43 | 27.43 | 27.43 |
| FWD/PORT/TOP | -25.69 | -25.69 | -25.69 | -25.69 | -25.69 |
| AFT/PORT/TOP | -25.69 | -25.69 | -25.69 | -25.69 | -25.69 |
| FWD/STBD/TOP | 25.69 | 25.69 | 25.69 | 25.69 | 25.69 |
| AFT/STBD/TOP | 25.69 | 25.69 | 25.69 | 25.69 | 25.69 |
| DIST ABV BASELINE FWD, FT | 30.29 | 30.09 | 29.91 | 29.75 | 29.62 |
| DIST ABV BASELINE AFT, FT | 30.09 | 29.91 | 29.75 | 29.62 | 29.51 |
| HEIGHT, FT | 9.84 | 9.84 | 9.84 | 9.84 | 9.84 |
| VOLUME, FT3 | 5249. | 5243. | 5237. | 5231. | 5225. |
| ARR AREA, FT2 | 517.6 | 517.6 | 517.6 | 517.6 | 517.6 |

| | DECKHOUSE NUMBER | | | | |
|---|---|---|---|---|---|
| | 16 | 17 | 18 | 19 | 20 |
| DIST FROM BOW, FT | 225.06 | 235.00 | 244.94 | 254.88 | 76.00 |
| LENGTH, FT | 9.94 | 9.94 | 9.94 | 9.94 | 22.65 |
| DIST FROM CL, FT | | | | | |
| FWD/PORT/BTM | -27.43 | -27.43 | -27.43 | -27.46 | -15.56 |
| AFT/PORT/BTM | -27.43 | -27.43 | -27.46 | -27.43 | -17.74 |
| FWD/STBD/BTM | 27.43 | 27.43 | 27.43 | 27.46 | 15.56 |

| | | | | | |
|---|---|---|---|---|---|
| AFT/STBD/BTM | 27.43 | 27.43 | 27.46 | 27.43 | 17.74 |
| FWD/PORT/TOP | -25.69 | -25.69 | -25.69 | -25.72 | -13.83 |
| AFT/PORT/TOP | -25.69 | -25.69 | -25.72 | -25.70 | -16.01 |
| FWD/STBD/TOP | 25.69 | 25.69 | 25.69 | 25.72 | 13.83 |
| AFT/STBD/TOP | 25.69 | 25.69 | 25.72 | 25.70 | 16.01 |
| DIST ABV BASELINE FWD, FT | 29.51 | 29.43 | 29.36 | 29.32 | 42.55 |
| DIST ABV BASELINE AFT, FT | 29.43 | 29.36 | 29.32 | 29.31 | 42.55 |
| HEIGHT, FT | 9.84 | 9.84 | 9.84 | 9.84 | 9.84 |
| VOLUME, FT3 | 5219. | 5213. | 5210. | 5204. | 7038. |
| ARR AREA, FT2 | 517.6 | 517.6 | 517.8 | 517.9 | 701.0 |

PRINTED REPORT NO. 3 - DECKHOUSE STRUCTURE WEIGHT SUMMARY

DKHS MTRL TYPE IND-HTS
FIRE PROTECT IND-NONE
BLAST RESIST IND-7 PSI

DKHS STRUCT DENSITY, LBM/FT3 4.18
HANGER VOL, FT3 0.

| | WT-LTON | VCG-FT | LCG-FT |
|---|---|---|---|
| CALCULATED SWBS150 | 201.0 | 36.41 | 166.15 |

| DECK HOUSE | VOLUME FT3 | VCG FROM BL FT |
|---|---|---|
| NO. 1 | 4579. | 38.29 |
| NO. 2 | 4750. | 37.87 |
| NO. 3 | 4893. | 37.47 |
| NO. 4 | 5011. | 37.10 |
| NO. 5 | 5104. | 36.75 |
| NO. 6 | 5172. | 36.42 |
| NO. 7 | 5220. | 36.11 |
| NO. 8 | 5248. | 35.82 |
| NO. 9 | 5258. | 35.56 |
| NO.10 | 5255. | 35.32 |
| NO.11 | 5249. | 35.10 |
| NO.12 | 5243. | 34.91 |
| NO.13 | 5237. | 34.74 |
| NO.14 | 5231. | 34.59 |
| NO.15 | 5225. | 34.46 |
| NO.16 | 5219. | 34.36 |
| NO.17 | 5213. | 34.28 |
| NO.18 | 5210. | 34.22 |
| NO.19 | 5204. | 34.19 |
| NO.20 | 7038. | 47.38 |
| | 104558. | 36.41 |

C,E>RUN,HULL STRUC
COMMAND STRING IS:
RUN,HULL STRUCT MODULE

ASSET/MONOSC VERSION 3.3+ - HULL STRUCT MODULE - 2/11/95 10.59.21.

PRINTED REPORT NO. 1 - SUMMARY

INNER BOT IND-PRESENT
STIFFENER SHAPE IND-CALC

HULL LOADS IND-CALC

----------------------- HULL STRENGTH AND STRESS ----------------------

| | | | |
|---|---|---|---|
| HOGGING BM, FT-LTON | 65606. | PRIM STRESS KEEL-HOG, KSI | 15.46 |
| SAGGING BM, FT-LTON | 54696. | PRIM STRESS KEEL-SAG, KSI | 12.89 |
| MIDSHIP MOI, FT2-IN2 | 139566. | PRIM STRESS DECK-HOG, KSI | 16.14 |
| DIST N.A. TO KEEL, FT | 14.68 | PRIM STRESS DECK-SAG, KSI | 13.46 |
| DIST N.A. TO DECK, FT | 15.33 | HULL MARGIN STRESS, KSI | 2.24 |
| SEC MOD TO KEEL, FT-IN2 | 9508. | SEC MOD TO DECK, FT-IN2 | 9105. |

HULL STRUCTURE COMPONENTS

| | MATERIAL TYPE | NO OF SEGMENT | NO |
|---|---|---|---|
| WET. DECK | HTS | 4 | 1 |
| SIDE SHELL | HTS | 4 | 1 |
| BOTTOM SHELL | HTS | 6 | 1 |
| INNER BOTTOM | HTS | 5 | 1 |
| INT. DECK | HTS | 4 | 2 |
| STRINGER, SHEER | HTS | 1 | 1 |
| LONG BULKHEAD | | | 0 |
| TRANS BULKHEAD | HTS | | 13 |

HULL STRUCTURE WEIGHT

| SWBS | COMPONENT | WEIGHT, LTON | VCG, FT |
|---|---|---|---|
| 100 | HULL STRUCTURE | 759.4 | 18.71 |
| 110 | SHELL+SUPPORT | 362.1 | 13.95 |
| 120 | HULL STRUCTURAL BHD | 78.0 | 18.79 |
| 130 | HULL DECKS | 260.9 | 26.76 |
| 140 | HULL PLATFORM/FLATS | 58.5 | 12.22 |

PRINTED REPORT NO. 2 - HULL STRUCTURES WEIGHT

| SWBS | COMPONENT | WT-LTON | VCG-FT |
|---|---|---|---|
| 100 | HULL STRUCTURES | 759.4 | 18.71 |
| 110 | SHELL + SUPPORTS | 362.1 | 13.95 |
| 111 | PLATING | 218.4 | 18.76 |
| 113 | INNER BOTTOM | 36.4 | 4.50 |
| 115 | STANCHIONS | 5.1 | 15.00 |
| 116 | LONG FRAMING | 64.2 | 1.49 |
| 117 | TRANS FRAMING | 38.0 | 16.26 |
| 120 | HULL STRUCTURAL BULKHDS | 78.0 | 18.79 |
| 121 | LONG BULKHDS | | |
| 122 | TRANS BULKHDS | 66.6 | 18.79 |
| 123 | TRUNKS + ENCLOSURES | 11.3 | 18.79 |
| 130 | HULL DECKS | 260.9 | 26.76 |
| 131 | MAIN DECK | 153.3 | 31.05 |
| 132 | 2ND DECK | 107.6 | 20.66 |
| 133 | 3RD DECK | | |
| 134 | 4TH DECK | | |
| 135 | 5TH DECK+DECKS BELOW | | |
| 136 | 01 HULL DECK | | |
| 140 | HULL PLATFORMS/FLATS | 58.5 | 12.22 |
| 141 | 1ST PLATFORM | 58.5 | 12.22 |
| 142 | 2ND PLATFORM | | |
| 143 | 3RD PLATFORM | | |
| 144 | 4TH PLATFORM | | |
| 145 | 5TH PLAT+PLATS BELOW | | |

* DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS

PRINTED REPORT NO. 3 - WEATHER DECK

DECK MTRL TYPE-HTS
STRINGER PLATE MTRL TYPE-HTS

| | SHELL | STRINGER PLATE |
|---|---|---|
| MODULUS OF ELASTICITY, KSI | 29600.0 | 29600.0 |
| DENSITY, LBM/FT3 | 489.02 | 489.02 |
| YIELD STRENGTH, KSI | 45.00 | 45.00 |
| MAX PRIMARY STRENGTH, KSI | 21.28 | 21.28 |
| ALLOWABLE WORKING STRENGTH, KSI | 38.00 | 38.00 |

HULL LOADS IND-CALC

| | MAX | MIN |
|---|---|---|
| STIFFENER SPACING, IN | 24.00 | 24.00 |
| STRINGER PLATE WIDTH, FT | 6.00 | |

SEGMENT GEOMETRY

| | --------NODE COORD, FT | | | | -------------------SCND. LOAD, FT-- | |
|---|---|---|---|---|---|---|
| SEG | YIB | ZIB | YOB | ZOB | HEAD1 | HEAD2 |
| 1 | 0.00 | 30.01 | 6.86 | 30.01 | 8.25 | |
| 2 | 6.86 | 30.01 | 13.72 | 30.01 | 8.25 | |
| 3 | 13.72 | 30.01 | 20.57 | 30.01 | 8.25 | |
| 4 | 20.57 | 30.01 | 27.43 | 30.01 | 8.25 | |

SEGMENT SCANTLINGS

| | ----------------SCANTLINGS OF STIFFENED PLATES----------------- | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | STIFFENERS | | | | CATLG | NO.OF | PLATE | SPACING |
| SEG | ---------INXINXIN/IN-------------- | | | | NO | STIFF | TK, IN | IN |
| 1 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 3 | 0.3438 | 20.57 |
| 2 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 3 | 0.3438 | 20.57 |
| 3 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 3 | 0.3438 | 20.57 |
| 4 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 3 | 0.3438 | 20.57 |

NOTE: *R STANDS FOR ROLLED SHAPE

SEGMENT PROPERTIES

| | ----------------PROPERTIES OF STIFFENED PLATES------------------ | | | | | | |
|---|---|---|---|---|---|---|---|
| | -------AREA------ | | N.A. TO | -----SEC MOD----- | | | SMEAR |
| | TOTAL | SHEAR | PLATE | PLATE | FLANGE | WT/FT | RATIO |
| SEG | IN2 | IN2 | IN | IN3 | IN3 | LBF/FT | |
| 1 | 8.51 | 0.73 | 0.71 | 19.92 | 3.91 | 28.91 | 0.20 |
| 2 | 8.51 | 0.73 | 0.71 | 19.92 | 3.91 | 28.91 | 0.20 |
| 3 | 8.51 | 0.73 | 0.71 | 19.92 | 3.91 | 28.91 | 0.20 |
| 4 | 8.51 | 0.73 | 0.71 | 19.92 | 3.91 | 28.91 | 0.20 |

PRINTED REPORT NO. 4 - SIDE SHELL

SIDE SHELL MTRL TYPE-HTS
SHEER STRAKE MTRL TYPE-HTS

| | SHELL | SHEER STRAKE |
|---|---|---|
| MODULUS OF ELASTICITY, KSI | 29600.0 | 29600.0 |
| DENSITY, LBM/FT3 | 489.02 | 489.02 |
| YIELD STRENGTH, KSI | 45.00 | 45.00 |
| MAX PRIMARY STRENGTH, KSI | 21.28 | 21.28 |
| ALLOWABLE WORKING STRENGTH, KSI | 38.00 | 38.00 |

HULL LOADS IND-CALC

| | MAX | MIN |
|---|---|---|
| STIFFENER SPACING, IN | 24.00 | 24.00 |
| SHEER STRAKE WIDTH, FT | 6.00 | |

SEGMENT GEOMETRY

| | --------NODE COORD, FT | | | | -------------------SCND. LOAD, FT-- | |
|---|---|---|---|---|---|---|
| SEG | YUPR | ZUPR | YLWR | ZLWR | HEAD1 | HEAD2 |
| 1 | 27.43 | 30.01 | 26.54 | 24.01 | 7.81 | |
| 2 | 26.54 | 24.01 | 25.90 | 20.00 | 12.00 | |
| 3 | 25.90 | 20.00 | 24.56 | 12.25 | 17.89 | |
| 4 | 24.56 | 12.25 | 20.77 | 6.00 | 25.20 | |

SEGMENT SCANTLINGS

| | ----------------SCANTLINGS OF STIFFENED PLATES----------------- | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | STIFFENERS | | | | CATLG | NO.OF | PLATE | SPACING |
| SEG | ---------INXINXIN/IN-------------- | | | | NO | STIFF | TK, IN | IN |
| 1 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 4 | 0.2500 | 18.20 |
| 2 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 2 | 0.2500 | 16.24 |
| 3 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 3 | 0.2813 | 23.60 |
| 4 *R | 4.730X | 3.960X | 0.190/ | 0.210 | 2. | 4 | 0.3125 | 22.36 |

NOTE: *R STANDS FOR ROLLED SHAPE

SEGMENT PROPERTIES

| | PROPERTIES OF STIFFENED PLATES | | | | | | |
|---|---|---|---|---|---|---|---|
| | AREA | | N.A. TO | SEC MOD | | | SMEAR |
| | TOTAL | SHEAR | PLATE | PLATE | FLANGE | WT/FT | RATIO |
| SEG | IN2 | IN2 | IN | IN3 | IN3 | LBF/FT | |
| 1 | 5.99 | 0.71 | 0.87 | 14.53 | 3.80 | 20.34 | 0.32 |
| 2 | 5.50 | 0.71 | 0.94 | 13.18 | 3.79 | 18.68 | 0.35 |
| 3 | 8.08 | 0.72 | 0.70 | 19.59 | 3.86 | 27.43 | 0.22 |
| 4 | 8.72 | 1.00 | 0.89 | 26.22 | 5.36 | 29.60 | 0.25 |

PRINTED REPORT NO. 5 - BOTTOM SHELL

BOTTOM SHELL MTRL TYPE-HTS

| | |
|---|---|
| MODULUS OF ELASTICITY, KSI | 29600.0 |
| DENSITY, LBM/FT3 | 489.02 |
| YIELD STRENGTH, KSI | 45.00 |
| MAX PRIMARY STRENGTH, KSI | 21.28 |
| ALLOWABLE WORKING STRENGTH, KSI | 38.00 |

HULL LOADS IND-CALC

| | MAX | MIN |
|---|---|---|
| STIFFENER SPACING, IN | 24.00 | 24.00 |

SEGMENT GEOMETRY

| | NODE COORD, FT | | | | SCND. LOAD, FT | |
|---|---|---|---|---|---|---|
| SEG | YUPR | ZUPR | YLWR | ZLWR | HEAD1 | HEAD2 |
| 1 | 20.77 | 6.00 | 18.57 | 4.50 | 28.83 | |
| 2 | 18.57 | 4.50 | 16.46 | 3.45 | 30.05 | |
| 3 | 16.46 | 3.45 | 12.34 | 2.00 | 31.34 | |
| 4 | 12.34 | 2.00 | 8.23 | 1.00 | 32.55 | |
| 5 | 8.23 | 1.00 | 4.11 | 0.31 | 33.39 | |
| 6 | 4.11 | 0.31 | 0.00 | 0.00 | 33.89 | |

SEGMENT SCANTLINGS

| | SCANTLINGS OF STIFFENED PLATES | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | STIFFENERS | | | | CATLG | NO.OF | PLATE | SPACING |
| SEG | INXINXIN/IN | | | | NO | STIFF | TK, IN | IN |
| 1 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 1 | 0.3438 | 16.04 |
| 2 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 1 | 0.3438 | 14.00 |
| 3 *R | 4.730X | 3.960X | 0.190/ | 0.210 | 2. | 2 | 0.3438 | 17.46 |
| 4 *R | 4.730X | 3.960X | 0.190/ | 0.210 | 2. | 2 | 0.3438 | 16.99 |
| 5 *R | 4.730X | 3.960X | 0.190/ | 0.210 | 2. | 2 | 0.3438 | 16.52 |
| 6 *R | 4.730X | 3.960X | 0.190/ | 0.210 | 2. | 1 | 0.3438 | 19.13 |

NOTE: *R STANDS FOR ROLLED SHAPE

SEGMENT PROPERTIES

| | PROPERTIES OF STIFFENED PLATES | | | | | | |
|---|---|---|---|---|---|---|---|
| | AREA | | N.A. TO | SEC MOD | | | SMEAR |
| | TOTAL | SHEAR | PLATE | PLATE | FLANGE | WT/FT | RATIO |
| SEG | IN2 | IN2 | IN | IN3 | IN3 | LBF/FT | |
| 1 | 6.96 | 0.73 | 0.82 | 16.37 | 3.89 | 23.62 | 0.26 |
| 2 | 6.25 | 0.73 | 0.90 | 14.66 | 3.87 | 21.24 | 0.30 |
| 3 | 7.73 | 1.00 | 1.00 | 22.85 | 5.37 | 26.26 | 0.29 |
| 4 | 7.57 | 1.00 | 1.02 | 22.35 | 5.36 | 25.71 | 0.30 |
| 5 | 7.41 | 1.00 | 1.04 | 21.83 | 5.36 | 25.16 | 0.30 |
| 6 | 8.31 | 1.00 | 0.95 | 24.64 | 5.38 | 28.22 | 0.26 |

PRINTED REPORT NO. 6 - INNER BOTTOM

INNER BOT IND-PRESENT

INNER BOTTOM MTRL TYPE-HTS

| | |
|---|---|
| MODULUS OF ELASTICITY, KSI | 29600.0 |
| DENSITY, LBM/FT3 | 489.02 |

| | |
|---|---|
| YIELD STRENGTH, KSI | 45.00 |
| MAX PRIMARY STRENGTH, KSI | 21.28 |
| ALLOWABLE WORKING STRENGTH, KSI | 38.00 |

HULL LOADS IND-CALC

| | MAX | MIN |
|---|---|---|
| STIFFENER SPACING, IN | 24.00 | 24.00 |

SEGMENT GEOMETRY

| | --------NODE COORD, FT | | | ------------------- | SCND. LOAD, FT-- | |
|---|---|---|---|---|---|---|
| SEG | YUPR | ZUPR | YLWR | ZLWR | HEAD1 | HEAD2 |
| 1 | 18.57 | 4.50 | 16.46 | 4.50 | 2.61 | 30.91 |
| 2 | 16.46 | 4.50 | 12.34 | 4.50 | 2.70 | 29.43 |
| 3 | 12.34 | 4.50 | 8.23 | 4.50 | 2.70 | 27.38 |
| 4 | 8.23 | 4.50 | 4.11 | 4.50 | 2.70 | 25.32 |
| 5 | 4.11 | 4.50 | 0.00 | 4.50 | 2.70 | 23.26 |

SEGMENT SCANTLINGS

| | ----------------SCANTLINGS OF STIFFENED PLATES---------------- | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | STIFFENERS | | | | CATLG | NO.OF | PLATE | SPACING |
| SEG | ---------INXINXIN/IN | | | -------------- | NO | STIFF | TK, IN | IN |
| 1 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 1 | 0.2188 | 12.66 |
| 2 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 2 | 0.2500 | 16.46 |
| 3 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 2 | 0.2500 | 16.46 |
| 4 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 2 | 0.2500 | 16.46 |
| 5 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 2 | 0.2500 | 16.46 |

NOTE: *R STANDS FOR ROLLED SHAPE

SEGMENT PROPERTIES

| | ----------------PROPERTIES OF STIFFENED PLATES----------------- | | | | | | |
|---|---|---|---|---|---|---|---|
| | ------AREA------ | | N.A. TO | -----SEC MOD----- | | | SMEAR |
| | TOTAL | SHEAR | PLATE | PLATE | FLANGE | WT/FT | RATIO |
| SEG | IN2 | IN2 | IN | IN3 | IN3 | LBF/FT | |
| 1 | 4.21 | 0.71 | 1.17 | 9.56 | 3.71 | 14.30 | 0.52 |
| 2 | 5.55 | 0.71 | 0.93 | 13.33 | 3.79 | 18.86 | 0.35 |
| 3 | 5.55 | 0.71 | 0.93 | 13.33 | 3.79 | 18.86 | 0.35 |
| 4 | 5.55 | 0.71 | 0.93 | 13.33 | 3.79 | 18.86 | 0.35 |
| 5 | 5.55 | 0.71 | 0.93 | 13.33 | 3.79 | 18.86 | 0.35 |

PRINTED REPORT NO. 7 - INTERNAL DECKS

NUMBER OF INTERNAL DECKS 2

INTERNAL DECK MTRL TYPE-HTS

| | |
|---|---|
| MODULUS OF ELASTICITY, KSI | 29600.0 |
| DENSITY, LBM/FT3 | 489.02 |
| YIELD STRENGTH, KSI | 45.00 |
| MAX PRIMARY STRENGTH, KSI | 21.28 |
| ALLOWABLE WORKING STRENGTH, KSI | 38.00 |

HULL LOADS IND-CALC

| | MAX | MIN |
|---|---|---|
| STIFFENER SPACING, IN | 24.00 | 24.00 |

SEGMENT GEOMETRY

| | --------NODE COORD, FT | | | ------------------- | SCND. LOAD, FT-- | |
|---|---|---|---|---|---|---|
| SEG | YIB | ZIB | YOB | ZOB | HEAD1 | HEAD2 |
| DECK NO.1 | | | | | | |
| SEG | | | | | | |
| 1 | 0.00 | 20.00 | 6.86 | 20.00 | 2.67 | 17.21 |
| 2 | 6.86 | 20.00 | 13.72 | 20.00 | 2.67 | 20.64 |
| 3 | 13.72 | 20.00 | 20.57 | 20.00 | 2.67 | 25.07 |
| 4 | 20.57 | 20.00 | 25.90 | 20.00 | 2.72 | 20.46 |

DECK NO.2

| SEG | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 0.00 | 12.25 | 6.86 | 12.25 | 2.67 | 17.21 |
| 2 | 6.86 | 12.25 | 13.72 | 12.25 | 2.67 | 20.64 |
| 3 | 13.72 | 12.25 | 24.56 | 12.25 | 2.67 | 25.07 |

SEGMENT SCANTLINGS

| SEG | STIFFENERS INXINXIN/IN | | | | CATLG NO | NO.OF STIFF | PLATE TK, IN | SPACING IN |
|---|---|---|---|---|---|---|---|---|
| DECK NO.1 | | | | | | | | |
| SEG | | | | | | | | |
| 1 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 3 | 0.2188 | 20.57 |
| 2 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 3 | 0.2188 | 20.57 |
| 3 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 3 | 0.2188 | 20.57 |
| 4 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 2 | 0.2813 | 21.30 |
| DECK NO.2 | | | | | | | | |
| SEG | | | | | | | | |
| 1 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 3 | 0.2188 | 20.57 |
| 2 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 3 | 0.2188 | 20.57 |
| 3 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 5 | 0.2188 | 21.69 |

SCANTLINGS OF STIFFENED PLATES

NOTE: *R STANDS FOR ROLLED SHAPE

SEGMENT PROPERTIES

| SEG | AREA TOTAL IN2 | AREA SHEAR IN2 | N.A. TO PLATE IN | SEC MOD PLATE IN3 | SEC MOD FLANGE IN3 | WT/FT LBF/FT | SMEAR RATIO |
|---|---|---|---|---|---|---|---|
| DECK NO.1 | | | | | | | |
| SEG | | | | | | | |
| 1 | 5.94 | 0.71 | 0.86 | 14.59 | 3.78 | 20.18 | 0.32 |
| 2 | 5.94 | 0.71 | 0.86 | 14.59 | 3.78 | 20.18 | 0.32 |
| 3 | 5.94 | 0.71 | 0.86 | 14.59 | 3.78 | 20.18 | 0.32 |
| 4 | 7.43 | 0.72 | 0.75 | 18.02 | 3.85 | 25.24 | 0.24 |
| DECK NO.2 | | | | | | | |
| SEG | | | | | | | |
| 1 | 5.94 | 0.71 | 0.86 | 14.59 | 3.78 | 20.18 | 0.32 |
| 2 | 5.94 | 0.71 | 0.86 | 14.59 | 3.78 | 20.18 | 0.32 |
| 3 | 6.19 | 0.71 | 0.83 | 15.27 | 3.79 | 21.01 | 0.30 |

PROPERTIES OF STIFFENED PLATES

PRINTED REPORT NO. 8 - STRENGTH AND STRESS OF STIFFENED PLATE AT DESIGN LOAD

INNER BOT IND-PRESENT

| SEG | PRIMARY STRESS TENSION KSI | PRIMARY STRESS COMP. KSI | LOCAL STRESS BEND. KSI | LOCAL STRESS SHEAR KSI | STRENGTH BUCKL. KSI | STRENGTH ULTIMATE KSI | STRENGTH COLUMN KSI |
|---|---|---|---|---|---|---|---|
| WET DECK | | | | | | | |
| 1 | 16.11 | 13.43 | 6.61 | 2.21 | 29.89 | 33.06 | 33.54 |
| 2 | 16.11 | 13.43 | 6.61 | 2.21 | 29.89 | 33.06 | 33.54 |
| 3 | 16.11 | 13.43 | 6.61 | 2.21 | 29.89 | 33.06 | 33.54 |
| 4 | 16.11 | 13.43 | 6.61 | 2.21 | 29.89 | 33.06 | 33.54 |
| SIDE SHELL | | | | | | | |
| 1 | 14.54 | 12.28 | 5.69 | 1.90 | 20.20 | 28.69 | 36.11 |
| 2 | 11.96 | 10.38 | 7.84 | 2.60 | 25.37 | 31.21 | 36.70 |
| 3 | 8.90 | 8.14 | 16.67 | 5.59 | 15.21 | 25.70 | 33.81 |
| 4 | 9.81 | 10.47 | 16.01 | 5.38 | 20.91 | 29.07 | 38.30 |
| BOT SHELL | | | | | | | |
| 1 | 10.93 | 12.35 | 18.12 | 6.04 | 38.96 | 38.65 | 35.26 |
| 2 | 11.31 | 12.99 | 16.55 | 5.49 | 41.29 | 41.46 | 36.07 |
| 3 | 11.71 | 13.66 | 15.54 | 5.19 | 36.97 | 36.79 | 39.15 |
| 4 | 12.09 | 14.28 | 15.72 | 5.25 | 37.66 | 37.40 | 39.28 |
| 5 | 12.35 | 14.72 | 15.69 | 5.23 | 38.33 | 38.02 | 39.42 |
| 6 | 12.50 | 14.98 | 18.37 | 6.15 | 34.26 | 34.71 | 38.69 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| INNER BOT | | | | | | | |
| 1 | 11.15 | 12.70 | 16.06 | 5.26 | 31.97 | 33.83 | 38.19 |
| 2 | 11.15 | 12.70 | 19.47 | 6.46 | 24.69 | 30.91 | 36.64 |
| 3 | 11.15 | 12.70 | 18.11 | 6.01 | 24.69 | 30.91 | 36.64 |
| 4 | 11.15 | 12.70 | 16.75 | 5.56 | 24.69 | 30.91 | 36.64 |
| 5 | 11.15 | 12.70 | 15.39 | 5.11 | 24.69 | 30.91 | 36.64 |
| INT DECK NO. 1 | | | | | | | |
| 1 | 10.92 | 9.62 | 14.27 | 4.76 | 12.10 | 23.43 | 36.08 |
| 2 | 10.92 | 9.62 | 17.11 | 5.71 | 12.10 | 23.43 | 36.08 |
| 3 | 10.92 | 9.62 | 20.78 | 6.93 | 12.10 | 23.43 | 36.08 |
| 4 | 10.92 | 9.62 | 17.23 | 5.77 | 18.67 | 27.84 | 34.53 |
| INT DECK NO. 2 | | | | | | | |
| 1 | 0.00 | 0.00 | 14.27 | 4.76 | 12.10 | 23.43 | 36.08 |
| 2 | 0.00 | 0.00 | 17.11 | 5.71 | 12.10 | 23.43 | 36.08 |
| 3 | 0.00 | 0.00 | 21.88 | 7.31 | 10.89 | 22.43 | 35.79 |

PRINTED REPORT NO. 9 - FACTOR OF SAFETY OF STIFFENED PLATE AT DESIGN LOAD

INNER BOT IND-PRESENT

| | --PLATE- | -STIFFENER- | --------STIFFENED PLATE----------- | | |
|---|---|---|---|---|---|
| SEG | BUCKLING | SHEAR | COMP+BEND | ULTIMATE | TENSION+BEND. |
| WET DECK | | | | | |
| 1 | 2.12 | 10.30 | 1.30 | 1.40 | 1.67 |
| 2 | 2.12 | 10.30 | 1.30 | 1.40 | 1.67 |
| 3 | 2.12 | 10.30 | 1.30 | 1.40 | 1.67 |
| 4 | 2.12 | 10.30 | 1.30 | 1.40 | 1.67 |
| SIDE SHELL | | | | | |
| 1 | 1.55 | 12.03 | 1.52 | 1.41 | 1.88 |
| 2 | 2.20 | 8.77 | 1.59 | 1.76 | 1.92 |
| 3 | 1.55 | 4.08 | 1.25 | 1.57 | 1.49 |
| 4 | 1.72 | 4.24 | 1.31 | 1.63 | 1.47 |
| BOT SHELL | | | | | |
| 1 | 2.68 | 3.78 | 1.00 | 1.66 | 1.31 |
| 2 | 2.71 | 4.15 | 1.03 | 1.75 | 1.36 |
| 3 | 2.38 | 4.39 | 1.18 | 1.65 | 1.39 |
| 4 | 2.32 | 4.35 | 1.15 | 1.61 | 1.37 |
| 5 | 2.30 | 4.36 | 1.14 | 1.60 | 1.36 |
| 6 | 2.01 | 3.70 | 1.03 | 1.40 | 1.23 |
| INNER BOT | | | | | |
| 1 | 9.98 | 4.34 | 2.37 | 7.17 | 2.37 |
| 2 | 8.68 | 3.53 | 1.95 | 7.08 | 1.95 |
| 3 | 9.34 | 3.79 | 2.10 | 7.61 | 2.10 |
| 4 | 10.09 | 4.10 | 2.27 | 8.23 | 2.27 |
| 5 | 10.99 | 4.46 | 2.47 | 8.96 | 2.47 |
| INT DECK NO. 1 | | | | | |
| 1 | 6.37 | 4.79 | 2.66 | 7.91 | 2.66 |
| 2 | 5.31 | 3.99 | 2.22 | 6.60 | 2.22 |
| 3 | 4.38 | 3.29 | 1.83 | 5.43 | 1.83 |
| 4 | 9.86 | 3.95 | 2.20 | 9.03 | 2.20 |
| INT DECK NO. 2 | | | | | |
| 1 | 6.37 | 4.79 | 2.66 | 7.91 | 2.66 |
| 2 | 5.31 | 3.99 | 2.22 | 6.60 | 2.22 |
| 3 | 3.91 | 3.12 | 1.74 | 5.12 | 1.74 |

PRINTED REPORT NO. 10 - GIRDER PROPERTIES, STRENGTH ,STRESSES AND FACTOR OF SAFETY

DECK MTRL TYPE-HTS
BOT MTRL TYPE-HTS

HULL LOADS IND-CALC
GIRDER/STIFF.,POSITION

| | COORDINATE, FT YLOC | ZLOC | SCND. LOAD, FT HEAD1 | HEAD2 |
|---|---|---|---|---|
| WET DECK | | | | |
| GIRDER | | | | |
| 1 | 0.00 | 30.01 | 8.40 | |
| 2 | 6.86 | 30.01 | 8.40 | |
| 3 | 13.72 | 30.01 | 8.40 | |
| 4 | 20.57 | 30.01 | 8.40 | |
| INT DECK 1. | | | | |
| GIRDER | | | | |
| 1 | 0.00 | 20.00 | 2.70 | 8.82 |
| 2 | 6.86 | 20.00 | 2.70 | 12.25 |
| 3 | 13.72 | 20.00 | 2.70 | 15.68 |
| 4 | 20.57 | 20.00 | 2.70 | 19.10 |
| INT DECK 2. | | | | |
| GIRDER | | | | |
| 1 | 0.00 | 12.25 | 2.70 | 15.53 |
| 2 | 6.86 | 12.25 | 2.70 | 18.96 |
| 3 | 13.72 | 12.25 | 2.70 | 22.39 |
| BOTTOM | | | | |
| GIRDER | | | | |
| 1 | 0.00 | 0.00 | 0.29 | 34.01 |
| 2 | 4.11 | 0.31 | 0.29 | 33.70 |
| 3 | 8.23 | 1.00 | 0.29 | 33.01 |
| 4 | 12.34 | 2.00 | 0.29 | 32.00 |
| 5 | 16.46 | 3.45 | 0.29 | 31.30 |
| BOTTOM | | | | |
| STIFF. | | | | |
| 1 | 0.00 | 2.25 | 0.29 | 31.76 |
| 2 | 4.11 | 2.41 | 0.27 | 31.60 |
| 3 | 8.23 | 2.75 | 0.21 | 31.26 |
| 4 | 12.34 | 3.25 | 0.21 | 30.76 |
| 5 | 16.46 | 3.98 | 0.24 | 30.79 |

---------------SCANTLINGS OF GDR/STF AND PLATE-------------

| | GIRDER/STIFFENER INXINXIN/IN | | | | CATLG NO | PLATE TK, IN | SUPPORT WIDTH IN |
|---|---|---|---|---|---|---|---|
| WET DECK | | | | | | | |
| GIRDER | | | | | | | |
| 1 *F | 13.490X | 5.030X | 0.255/ | 0.420 | 49. | 0.3438 | 82.29 |
| 2 *F | 13.490X | 5.030X | 0.255/ | 0.420 | 49. | 0.3438 | 82.29 |
| 3 *F | 13.490X | 5.030X | 0.255/ | 0.420 | 49. | 0.3438 | 82.29 |
| 4 *F | 13.490X | 5.030X | 0.255/ | 0.420 | 49. | 0.3438 | 82.29 |
| INT DECK 1. | | | | | | | |
| GIRDER | | | | | | | |
| 1 *F | 9.780X | 4.010X | 0.240/ | 0.330 | 29. | 0.2188 | 82.29 |
| 2 *F | 11.810X | 4.010X | 0.235/ | 0.350 | 35. | 0.2188 | 82.29 |
| 3 *F | 11.840X | 6.490X | 0.230/ | 0.380 | 45. | 0.2188 | 82.29 |
| 4 *F | 11.840X | 6.490X | 0.230/ | 0.380 | 45. | 0.2188 | 73.09 |
| INT DECK 2. | | | | | | | |
| GIRDER | | | | | | | |
| 1 *F | 11.840X | 6.490X | 0.230/ | 0.380 | 45. | 0.2188 | 82.29 |
| 2 *F | 13.490X | 5.030X | 0.255/ | 0.420 | 49. | 0.2188 | 82.29 |
| 3 *F | 15.430X | 6.990X | 0.295/ | 0.430 | 67. | 0.2188 | 106.23 |
| BOTTOM | | | | | | | |
| GIRDER | | | | | | | |
| 1 | 54.000X | 17.190X | 0.344/ | 0.250 | | 0.3438 | 38.27 |
| 2 | 50.272X | 15.625X | 0.313/ | 0.250 | | 0.3438 | 43.91 |
| 3 | 42.037X | 12.500X | 0.250/ | 0.250 | | 0.3438 | 50.26 |
| 4 | 29.959X | 12.500X | 0.250/ | 0.250 | | 0.3438 | 51.67 |
| 5 | 12.594X | 12.594X | 0.281/ | 0.219 | | 0.3438 | 52.37 |

| BOTTOM STIFF. | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 0.3438 | 27.00 |
| 2 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 0.3125 | 27.00 |
| 3 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 0.2500 | 27.00 |
| 4 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 0.2500 | 27.00 |
| 5 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 0.2813 | 27.00 |

NOTE: *F STANDS FOR FABRICATED SHAPE
*R STANDS FOR ROLLED SHAPE

----------------PROPERTIES OF GDR/STF AND PLATES----------------

| | -------AREA------ | | N.A. TO | -----SEC MOD----- | | | SMEAR |
|---|---|---|---|---|---|---|---|
| | TOTAL IN2 | SHEAR IN2 | PLATE IN | PLATE IN3 | FLANGE IN3 | WT/FT LBF/FT | RATIO |
| WET DECK GIRDER | | | | | | | |
| 1 | 33.84 | 3.63 | 1.74 | 310.21 | 43.13 | 114.93 | 0.20 |
| 2 | 33.84 | 3.63 | 1.74 | 310.21 | 43.13 | 114.93 | 0.20 |
| 3 | 33.84 | 3.63 | 1.74 | 310.21 | 43.13 | 114.93 | 0.20 |
| 4 | 33.84 | 3.63 | 1.74 | 310.21 | 43.13 | 114.93 | 0.20 |
| INT DECK 1. GIRDER | | | | | | | |
| 1 | 21.68 | 2.48 | 1.26 | 144.05 | 20.09 | 73.61 | 0.20 |
| 2 | 22.19 | 2.91 | 1.63 | 176.34 | 26.70 | 75.34 | 0.23 |
| 3 | 23.20 | 2.86 | 2.11 | 190.49 | 38.86 | 78.77 | 0.29 |
| 4 | 21.18 | 2.86 | 2.30 | 170.92 | 38.72 | 71.94 | 0.32 |
| INT DECK 2. GIRDER | | | | | | | |
| 1 | 23.20 | 2.86 | 2.11 | 190.49 | 38.86 | 78.77 | 0.29 |
| 2 | 23.56 | 3.60 | 2.35 | 212.27 | 42.30 | 79.99 | 0.31 |
| 3 | 30.80 | 4.74 | 2.80 | 318.02 | 67.18 | 104.61 | 0.33 |
| BOTTOM GIRDER | | | | | | | |
| 1 | 28.77 | 18.77 | 25.81 | 463.68 | 415.90 | 97.71 | 0.00 |
| 2 | 24.99 | 15.90 | 23.99 | 382.95 | 341.78 | 84.86 | 0.00 |
| 3 | 17.93 | 10.66 | 19.97 | 242.36 | 213.55 | 60.90 | 0.00 |
| 4 | 14.91 | 7.64 | 14.12 | 158.49 | 136.23 | 50.64 | 0.00 |
| 5 | 10.63 | 3.70 | 5.67 | 58.43 | 44.20 | 36.09 | 0.00 |
| BOTTOM STIFF. | | | | | | | |
| 1 | 10.72 | 0.73 | 0.60 | 24.43 | 3.93 | 36.41 | 0.16 |
| 2 | 9.88 | 0.72 | 0.61 | 23.21 | 3.90 | 33.54 | 0.17 |
| 3 | 8.19 | 0.71 | 0.67 | 20.21 | 3.84 | 27.81 | 0.21 |
| 4 | 8.19 | 0.71 | 0.67 | 20.21 | 3.84 | 27.81 | 0.21 |
| 5 | 9.04 | 0.72 | 0.64 | 21.81 | 3.87 | 30.68 | 0.19 |

-----------------STRENGTH AND STRESSES OF GDR.STF------------
AT DESIGN LOAD

| | -PRIMARY STRESS- | | -LOCAL STRESS- | | --------STRENGTH-------- | | |
|---|---|---|---|---|---|---|---|
| | TENSION KSI | COMP. KSI | BEND. KSI | SHEAR KSI | BUCKL. KSI | ULTIMATE KSI | COLUMN KSI |
| WET DECK GIRDER | | | | | | | |
| 1 | 16.11 | 13.43 | 16.00 | 4.64 | 35.83 | 35.87 | 37.43 |
| 2 | 16.11 | 13.43 | 16.00 | 4.64 | 35.83 | 35.87 | 37.43 |
| 3 | 16.11 | 13.43 | 16.00 | 4.64 | 35.83 | 35.87 | 37.43 |
| 4 | 16.11 | 13.43 | 16.00 | 4.64 | 35.83 | 35.87 | 37.43 |
| INT DECK 1. GIRDER | | | | | | | |
| 1 | 10.92 | 9.62 | 36.09 | 7.14 | 41.28 | 41.44 | 30.58 |
| 2 | 10.92 | 9.62 | 37.71 | 8.45 | 37.24 | 37.02 | 35.43 |
| 3 | 10.92 | 9.62 | 33.17 | 11.00 | 36.60 | 36.48 | 38.16 |
| 4 | 10.92 | 9.62 | 36.04 | 11.90 | 36.60 | 36.48 | 38.75 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| INT DECK 2. | | | | | | | |
| GIRDER | | | | | | | |
| 1 | 0.00 | 0.00 | 32.86 | 10.89 | 36.60 | 36.48 | 38.16 |
| 2 | 0.00 | 0.00 | 36.85 | 10.56 | 35.83 | 35.87 | 39.82 |
| 3 | 0.00 | 0.00 | 35.37 | 12.23 | 36.16 | 36.12 | 42.11 |
| BOTTOM GIRDER | | | | | | | |
| 1 | 12.54 | 15.04 | 0.03 | 0.01 | 17.35 | 27.07 | 45.00 |
| 2 | 12.44 | 14.88 | 0.04 | 0.02 | 16.54 | 26.57 | 45.00 |
| 3 | 12.23 | 14.52 | 7.76 | 3.80 | 15.14 | 25.65 | 45.00 |
| 4 | 11.92 | 14.00 | 12.13 | 5.28 | 29.81 | 33.03 | 45.00 |
| 5 | 11.47 | 13.25 | 37.05 | 10.80 | 44.63 | 45.00 | 42.59 |
| BOTTOM STIFF. | | | | | | | |
| 1 | 11.84 | 13.87 | 33.24 | 11.19 | 44.66 | 45.00 | 31.28 |
| 2 | 11.79 | 13.79 | 33.33 | 11.22 | 44.66 | 45.00 | 32.01 |
| 3 | 11.69 | 13.61 | 33.49 | 11.26 | 44.66 | 45.00 | 33.58 |
| 4 | 11.53 | 13.35 | 32.95 | 11.08 | 44.66 | 45.00 | 33.58 |
| 5 | 11.31 | 12.98 | 32.72 | 11.01 | 44.66 | 45.00 | 32.77 |

-------------------FACTOR OF SAFETY OF GDR.STF-----------
AT DESIGN LOAD

| | --PLATE- BUCKLING | -STIFFENER- SHEAR | --------STIFFENED PLATE----------- COMP+BEND | ULTIMATE | TENSION+BEND. |
|---|---|---|---|---|---|
| WET DECK | | | | | |
| GIRDER | | | | | |
| 1 | 2.46 | 4.92 | 1.05 | 1.64 | 1.18 |
| 2 | 2.46 | 4.92 | 1.05 | 1.64 | 1.18 |
| 3 | 2.46 | 4.92 | 1.05 | 1.64 | 1.18 |
| 4 | 2.46 | 4.92 | 1.05 | 1.64 | 1.18 |
| INT DECK 1. | | | | | |
| GIRDER | | | | | |
| 1 | 15.97 | 3.19 | 1.05 | 8.72 | 1.05 |
| 2 | 12.70 | 2.70 | 1.01 | 7.95 | 1.01 |
| 3 | 10.54 | 2.07 | 1.15 | 7.12 | 1.15 |
| 4 | 8.73 | 1.92 | 1.05 | 6.00 | 1.05 |
| INT DECK 2. | | | | | |
| GIRDER | | | | | |
| 1 | 10.63 | 2.09 | 1.16 | 7.19 | 1.16 |
| 2 | 9.50 | 2.16 | 1.03 | 6.73 | 1.03 |
| 3 | 9.43 | 1.86 | 1.07 | 7.05 | 1.07 |
| BOTTOM GIRDER | | | | | |
| 1 | 1.15 | 1559.71 | 2.39 | 1.44 | 3.02 |
| 2 | 1.11 | 1151.28 | 2.41 | 1.43 | 3.04 |
| 3 | 4.31 | 6.01 | 4.90 | 5.84 | 4.90 |
| 4 | 5.57 | 4.32 | 3.13 | 4.94 | 3.13 |
| 5 | 3.10 | 2.11 | 1.03 | 2.37 | 1.03 |
| BOTTOM STIFF. | | | | | |
| 1 | 16.26 | 2.04 | 1.14 | 9.11 | 1.14 |
| 2 | 15.52 | 2.03 | 1.14 | 8.90 | 1.14 |
| 3 | 13.66 | 2.02 | 1.13 | 8.22 | 1.13 |
| 4 | 13.88 | 2.06 | 1.15 | 8.35 | 1.15 |
| 5 | 14.97 | 2.07 | 1.16 | 8.79 | 1.16 |

PRINTED REPORT NO. 11 - LONGITUDINAL BULKHEADS

NUMBER OF LONG BHD 0

PRINTED REPORT NO. 12 - TRANSVERSE BULKHEADS

TRANS BHD MTRL TYPE-HTS
MODULUS OF ELASTICITY, KSI 29600.0

| | |
|---|---|
| DENSITY, LBM/FT3 | 489.02 |
| YIELD STRENGTH, KSI | 45.00 |
| MAX PRIMARY STRENGTH, KSI | 21.28 |
| ALLOWABLE WORKING STRENGTH, KSI | 38.00 |

HULL LOADS IND-CALC

| | MAX | MIN |
|---|---|---|
| STIFFENER SPACING, IN | 24.00 | 24.00 |

SEGMENT GEOMETRY

| | --------NODE COORD, FT | | | -------------------- | SCND. LOAD, FT-- | |
|---|---|---|---|---|---|---|
| SEG | YUPR | ZUPR | YLWR | ZLWR | HEAD1 | HEAD2 |
| 1 | 0.00 | 30.01 | 0.00 | 20.00 | 21.56 | |
| 2 | 0.00 | 20.00 | 0.00 | 12.25 | 27.61 | |
| 3 | 0.00 | 12.25 | 0.00 | 4.50 | 31.32 | |

SEGMENT SCANTLINGS

| | -----------------SCANTLINGS OF STIFFENED PLATES----------------- | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | STIFFENERS | | | | CATLG | NO.OF | PLATE | SPACING |
| SEG | ---------INXINXIN/IN-------------- | | | | NO | STIFF | TK, IN | IN |
| 1 *F | 7.685X | 3.940X | 0.170/ | 0.205 | 6 | 16 | 0.1875 | 24.02 |
| 2 *R | 5.735X | 3.970X | 0.200/ | 0.225 | 5 | 15 | 0.1875 | 23.25 |
| 3 *F | 7.685X | 3.940X | 0.170/ | 0.205 | 6 | 15 | 0.1875 | 23.25 |

NOTE: *F STANDS FOR FABRICATED SHAPE
*R STANDS FOR ROLLED SHAPE

SEGMENT PROPERTIES

| | ----------------PROPERTIES OF STIFFENED PLATES------------------ | | | | | | |
|---|---|---|---|---|---|---|---|
| | ------AREA------ | | N.A. TO | -----SEC MOD----- | | | SMEAR |
| | TOTAL | SHEAR | PLATE | PLATE | FLANGE | WT/FT | RATIO |
| SEG | IN2 | IN2 | IN | IN3 | IN3 | LBF/FT | |
| 1 | 6.61 | 1.37 | 1.83 | 31.02 | 9.09 | 22.46 | 0.47 |
| 2 | 6.40 | 1.23 | 1.45 | 22.62 | 7.00 | 21.73 | 0.47 |
| 3 | 6.47 | 1.37 | 1.87 | 30.14 | 9.07 | 21.97 | 0.48 |

| | ----------STRENGTH AND STRESSES----------- AT DESIGN LOAD | | | | |
|---|---|---|---|---|---|
| | --LOCAL STRESS-- | | --------STRENGTH-------- | | |
| | BEND. | SHEAR | BUCKL. | ULTIMATE | COLUMN |
| SEG | KSI | KSI | KSI | KSI | KSI |
| 1 | 35.15 | 8.51 | 10.89 | 22.43 | 35.79 |
| 2 | 37.90 | 9.78 | 10.89 | 22.43 | 35.79 |
| 3 | 34.11 | 11.53 | 10.89 | 22.43 | 35.79 |

| | -----------------------FACTOR OF SAFETY------------------ AT DESIGN LOAD | | | | |
|---|---|---|---|---|---|
| | --PLATE- | -STIFFENER- | --------STIFFENED PLATE----------- | | |
| SEG | BUCKLING | SHEAR | COMP+BEND | ULTIMATE | TENSION+BEND. |
| 1 | 3.91 | 2.68 | 1.08 | 5.12 | 1.74 |
| 2 | 3.91 | 2.33 | 1.00 | 5.12 | 1.74 |
| 3 | 3.91 | 1.98 | 1.11 | 5.12 | 1.74 |

PRINTED REPORT NO. 13 - SIDE AND BOTTOM FRAMES

FRAME SPACING, FT 8.00

SEGMENT GEOMETRY

| | --------NODE COORD, FT | | | -------------------- | SCND. LOAD, FT-- | |
|---|---|---|---|---|---|---|
| SEG | YUPR | ZUPR | YLWR | ZLWR | HEAD1 | HEAD2 |
| SIDE FRAME | | | | | | |
| SEG | | | | | | |
| 1 | 27.43 | 30.01 | 25.90 | 20.00 | 14.01 | |
| 2 | 25.90 | 20.00 | 24.56 | 12.25 | 21.76 | |
| 3 | 24.56 | 12.25 | 18.57 | 4.50 | 29.51 | |

BOT FRAME

| SEG | | | | | |
|---|---|---|---|---|---|
| 1 | 18.57 | 4.50 | 16.46 | 3.45 | 30.56 |
| 2 | 16.46 | 3.45 | 12.34 | 2.00 | 32.00 |
| 3 | 12.34 | 2.00 | 8.23 | 1.00 | 33.01 |
| 4 | 8.23 | 1.00 | 4.11 | 0.31 | 33.70 |
| 5 | 4.11 | 0.31 | 0.00 | 0.00 | 34.01 |

SEGMENT SCANTLINGS

| | ----SCANTLINGS OF STIFFENED PLATES---- STIFFENERS ---INXINXIN/IN--- | | | | CATLG NO | PLATE TK, IN | SPAN FT |
|---|---|---|---|---|---|---|---|
| SIDE FRAME SEG | | | | | | | |
| 1 *F | 11.810X | 4.010X | 0.235/ | 0.350 | 35. | 0.2500 | 10.01 |
| 2 *F | 11.810X | 4.010X | 0.235/ | 0.350 | 35. | 0.2500 | 7.75 |
| 3 *F | 13.405X | 5.000X | 0.230/ | 0.335 | 40. | 0.2813 | 7.75 |
| BOT FRAME SEG | | | | | | | |
| 1 | 6.297X | 6.297X | 0.219/ | 0.219 | | 0.3438 | 2.36 |
| 2 | 21.277X | 12.500X | 0.250/ | 0.250 | | 0.3438 | 4.36 |
| 3 | 35.998X | 12.500X | 0.250/ | 0.250 | | 0.3438 | 4.24 |
| 4 | 46.154X | 12.500X | 0.250/ | 0.250 | | 0.3438 | 4.17 |
| 5 | 52.136X | 12.500X | 0.250/ | 0.250 | | 0.3438 | 4.13 |

NOTE: *F STANDS FOR FABRICATED SHAPE

SEGMENT PROPERTIES

----PROPERTIES OF STIFFENED PLATES----

| SEG | AREA TOTAL IN2 | AREA SHEAR IN2 | N.A. TO PLATE IN | SEC MOD PLATE IN3 | SEC MOD FLANGE IN3 | WT/FT LBF/FT | SMEAR RATIO |
|---|---|---|---|---|---|---|---|
| SIDE FRAME SEG | | | | | | | |
| 1 | 28.18 | 2.92 | 1.32 | 225.92 | 26.95 | 95.70 | 0.17 |
| 2 | 28.18 | 2.92 | 1.32 | 225.92 | 26.95 | 95.70 | 0.17 |
| 3 | 31.76 | 3.22 | 1.53 | 290.81 | 35.58 | 107.87 | 0.18 |
| BOT FRAME SEG | | | | | | | |
| 1 | 4.92 | 1.50 | 2.94 | 14.13 | 10.62 | 16.71 | 0.18 |
| 2 | 12.74 | 5.47 | 9.98 | 105.46 | 88.45 | 43.27 | 0.18 |
| 3 | 16.42 | 9.15 | 17.04 | 198.95 | 173.32 | 55.77 | 0.18 |
| 4 | 18.96 | 11.69 | 21.98 | 273.67 | 242.77 | 64.39 | 0.18 |
| 5 | 20.46 | 13.18 | 24.90 | 321.62 | 287.78 | 69.47 | 0.18 |

STRESS AND FACTOR OF SAFETY

| | -STRESS, KSI- BENDING | SHEAR | ---FOS--- BENDING | SHEAR |
|---|---|---|---|---|
| SIDE FRAME SEG | | | | |
| 1 | 36.00 | 12.38 | 1.06 | 1.84 |
| 2 | 33.53 | 14.89 | 1.13 | 1.53 |
| 3 | 34.55 | 18.26 | 1.10 | 1.25 |
| BOT FRAME SEG | | | | |
| 1 | 17.31 | 12.36 | 2.20 | 1.85 |
| 2 | 7.83 | 6.58 | 4.85 | 3.47 |
| 3 | 3.95 | 3.94 | 9.61 | 5.79 |
| 4 | 2.82 | 3.10 | 13.49 | 7.36 |
| 5 | 2.36 | 2.74 | 16.10 | 8.31 |

PRINTED REPORT NO. 14 - DECK BEAMS

FRAME SPACING, FT 8.00

SEGMENT GEOMETRY

| SEG | YIB | ZIB | YOB | ZOB | HEAD1 | HEAD2 |
|---|---|---|---|---|---|---|
| | --------NODE COORD, FT | | | | -SCND. LOAD, FT-- | |
| WET DECK | | | | | | |
| SEG | | | | | | |
| 1 | 0.00 | 30.01 | 6.86 | 30.01 | 8.40 | |
| 2 | 6.86 | 30.01 | 13.72 | 30.01 | 8.40 | |
| 3 | 13.72 | 30.01 | 20.57 | 30.01 | 8.40 | |
| 4 | 20.57 | 30.01 | 27.43 | 30.01 | 8.40 | |
| DECK NO. 1 | | | | | | |
| SEG | | | | | | |
| 1 | 0.00 | 20.00 | 6.86 | 20.00 | 2.70 | |
| 2 | 6.86 | 20.00 | 13.72 | 20.00 | 2.70 | |
| 3 | 13.72 | 20.00 | 20.57 | 20.00 | 2.70 | |
| 4 | 20.57 | 20.00 | 25.90 | 20.00 | 2.81 | |
| DECK NO. 2 | | | | | | |
| SEG | | | | | | |
| 1 | 0.00 | 12.25 | 6.86 | 12.25 | 2.70 | |
| 2 | 6.86 | 12.25 | 13.72 | 12.25 | 2.70 | |
| 3 | 13.72 | 12.25 | 24.56 | 12.25 | 2.70 | |

SEGMENT SCANTLINGS

| | ----SCANTLINGS OF STIFFENED PLATES---- STIFFENERS ---INXINXIN/IN--- | | | | CATLG NO | PLATE TK, IN | SPAN FT |
|---|---|---|---|---|---|---|---|
| WET DECK | | | | | | | |
| SEG | | | | | | | |
| 1 *R | 5.735X | 3.970X | 0.200/ | 0.225 | 5. | 0.3438 | 6.86 |
| 2 *R | 5.735X | 3.970X | 0.200/ | 0.225 | 5. | 0.3438 | 6.86 |
| 3 *R | 5.735X | 3.970X | 0.200/ | 0.225 | 5. | 0.3438 | 6.86 |
| 4 *R | 5.735X | 3.970X | 0.200/ | 0.225 | 5. | 0.3438 | 6.86 |
| DECK NO. 1 | | | | | | | |
| SEG | | | | | | | |
| 1 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 0.2188 | 6.86 |
| 2 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 0.2188 | 6.86 |
| 3 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 0.2188 | 6.86 |
| 4 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 0.2813 | 5.32 |
| DECK NO. 2 | | | | | | | |
| SEG | | | | | | | |
| 1 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 0.2188 | 6.86 |
| 2 *R | 3.745X | 3.940X | 0.170/ | 0.205 | 1. | 0.2188 | 6.86 |
| 3 *F | 5.685X | 3.940X | 0.170/ | 0.215 | 3. | 0.2188 | 10.85 |

NOTE: *F STANDS FOR FABRICATED SHAPE
*R STANDS FOR ROLLED SHAPE

SEGMENT PROPERTIES

| SEG | ---AREA--- TOTAL IN2 | SHEAR IN2 | N.A. TO PLATE IN | --SEC MOD-- PLATE IN3 | FLANGE IN3 | WT/FT LBF/FT | SMEAR RATIO |
|---|---|---|---|---|---|---|---|
| WET DECK | | | | | | | |
| SEG | | | | | | | |
| 1 | 35.04 | 1.26 | 0.42 | 103.33 | 7.46 | 119.01 | 0.06 |
| 2 | 35.04 | 1.26 | 0.42 | 103.33 | 7.46 | 119.01 | 0.06 |
| 3 | 35.04 | 1.26 | 0.42 | 103.33 | 7.46 | 119.01 | 0.06 |
| 4 | 35.04 | 1.26 | 0.42 | 103.33 | 7.46 | 119.01 | 0.06 |
| DECK NO. 1 | | | | | | | |
| SEG | | | | | | | |
| 1 | 22.44 | 0.71 | 0.31 | 48.67 | 3.88 | 76.22 | 0.07 |
| 2 | 22.44 | 0.71 | 0.31 | 48.67 | 3.88 | 76.22 | 0.07 |
| 3 | 22.44 | 0.71 | 0.31 | 48.67 | 3.88 | 76.22 | 0.07 |
| 4 | 28.44 | 0.72 | 0.30 | 51.70 | 3.93 | 96.60 | 0.05 |
| DECK NO. 2 | | | | | | | |
| SEG | | | | | | | |
| 1 | 22.44 | 0.71 | 0.31 | 48.67 | 3.88 | 76.22 | 0.07 |

```
      2     22.44      0.71       0.31        48.67      3.88     76.22     0.07
      3     22.81      1.04       0.45        83.34      6.66     77.48     0.09

            STRESS AND FACTOR OF SAFETY
            -STRESS, KSI-     ------FOS-----
            BENDING  SHEAR    BENDING  SHEAR
   WET DECK
     SEG
      1     35.05    11.76     1.08     1.94
      2     35.05    11.76     1.08     1.94
      3     35.05    11.76     1.08     1.94
      4     35.05    11.76     1.08     1.94
   DECK NO.  1
     SEG
      1     21.88     6.74     1.74     3.38
      2     21.88     6.74     1.74     3.38
      3     21.88     6.74     1.74     3.38
      4     13.50     5.36     2.82     4.26
   DECK NO.  2
     SEG
      1     21.88     6.74     1.74     3.38
      2     21.88     6.74     1.74     3.38
      3     31.87     7.26     1.19     3.14

   PRINTED REPORT NO. 15 - LONGITUDINAL BULKHEAD VERTICAL STIFFENERS

     NUMBER OF LONG BHD  0

   C,E>RUN,APPEN
   COMMAND STRING IS:
     RUN,APPENDAGE MODULE
   ** WARNING - APPENDAGE MODULE ** (W-FINROTATSHIFT-FINREP)
   FWD FINS HAVE BEEN RE-POSITIONED BY SHIFTING FIN ROOT
   Z-COORD.    -0.74 FT (UPWARD POSITIVE) AND BY ROTATING
   ABOUT FIN ROOT    10.00 DEG (CLOCKWISE POSITIVE).
   ** WARNING - APPENDAGE MODULE ** (W-FINSPANRESIZE-FINRES)
   FWD FINS HAVE BEEN RESIZED:
        CHANGE IN CHORD           0.77 FT
        CHANGE IN THK            0.12 FT
         CHANGE IN SPAN          -0.72 FT
        CHANGE IN AREA            0.00 FT2

      ASSET/MONOSC VERSION 3.3+ - APPENDAGE MODULE - 2/11/95  11.01.00.

   PRINTED REPORT NO. 1 - SUMMARY

   APPENDAGE DISP, LTON          86.6

   SHELL DISP, LTON              15.0

   SKEG IND                    PRESENT    RUDDER TYPE IND                 SPADE
   SKEG DISP, LTON                10.0    NO RUDDERS                          2
   SKEG AFT LIMIT/LBP           0.8597    AVG RUDDER CHORD, FT             9.96
   SKEG THK, FT                   1.00    RUDDER THK, FT                   1.11
   SKEG PROJECTED AREA, FT2      350.1    RUDDER SPAN, FT                 12.11
                                          RUDDER PROJECTED AREA, FT2      120.6
   BILGE KEEL IND              PRESENT    RUDDER DISP, LTON                 5.1
   BILGE KEEL DISP, LTON           5.8
   BILGE KEEL LGTH, FT           89.78    FIN SIZE IND                     CALC
                                          NO FIN PAIRS                        1
   SHAFT SUPPORT TYPE IND          POD    FWD FIN
   SHAFT SUPPORT DISP, LTON       43.1       CHORD, FT                    11.10
   SHAFT DISP, LTON                0.0       THK, FT                       1.66
                                             SPAN, FT                      9.62
   PROP TYPE IND                    FP       PROJECTED AREA, FT2          106.7
```

| | | | |
|---|---|---|---|
| PROP BLADE DISP, LTON | 0.8 | DISP, LTON (PER PAIR) | 6.8 |
| NO PROP SHAFTS | 2 | AFT FIN | |
| PROP DIA, FT | 11.58 | CHORD, FT | |
| | | THK, FT | |
| SONAR DOME IND | NONE | SPAN, FT | |
| SONAR DISP, LTON | 0.0 | PROJECTED AREA, FT2 | |
| | | DISP, LTON (PER PAIR) | |

PRINTED REPORT NO. 2 - APPENDAGE BUOYANCY AND WEIGHT

| APPENDAGE | DISP, LTON | ----CENTER OF BUOYANCY---- X, FT | Y, FT | Z, FT |
|---|---|---|---|---|
| SHELL | 15.0 | 195.70 | 0.00 | 9.69 |
| SKEG | 10.0 | 296.00 | 0.00 | 2.56 |
| BILGE KEELS* | 5.8 | 147.25 | 18.08 | 6.22 |
| PODS* | 43.1 | 354.79 | 8.22 | 4.03 |
| PROP BLADES* | 0.8 | 345.68 | 8.22 | 2.35 |
| RUDDERS* | 5.1 | 372.86 | 8.22 | 7.04 |
| ROLL FIN PAIR* | 6.8 | 209.00 | 21.72 | 0.90 |
| TOTAL, LTON | 86.6 | | | |

* TRANSVERSE C.B. PER SIDE IS SHOWN

SWBS114, SHLL APNDG, LTON 17.14 SWBS565, ROLL FINS, LTON 37.36

```
C,E>RUN,RESI
COMMAND STRING IS:
  RUN,RESISTANCE MODULE
```

ASSET/MONOSC VERSION 3.3+ - RESISTANCE MODULE - 2/11/95 11.01.11.

PRINTED REPORT NO. 1 - SUMMARY

| | | | |
|---|---|---|---|
| RESID RESIST IND | NRC | BILGE KEEL IND | PRESENT |
| FRICTION LINE IND | ITTC | SHAFT SUPPORT TYPE IND | POD |
| ENDUR DISP IND | AVG DISP | PRPLN SYS RESIST IND | CALC |
| ENDUR CONFIG IND | NO TS | PROP TYPE IND | FP |
| SONAR DRAG IND | | SONAR DOME IND | NONE |
| SKEG IND | PRESENT | RUDDER TYPE IND | SPADE |
| FULL LOAD WT, LTON | 3813.4 | CORR ALW | 0.00050 |
| AVG ENDUR DISP, LTON | 3591.0 | DRAG MARGIN FAC | 0.080 |
| USABLE FUEL WT, LTON | 517.1 | TRAILSHAFT PWR FAC | |
| NO RUDDERS | 2. | | |
| NO FIN PAIRS | 1. | PRPLN SYS RESIST FRAC | |
| PROP TIP CLEAR RATIO | 0.25 | MAX SPEED | 0.190 |
| NO PROP SHAFTS | 2. | SUSTN SPEED | 0.211 |
| PROP DIA, FT | 11.58 | ENDUR SPEED | 0.400 |

| CONDITION | SPEED KT | ----EFFECTIVE HORSEPOWER, HP---- FRIC | RESID | APPDG | WIND | MARGIN | TOTAL | DRAG LBF |
|---|---|---|---|---|---|---|---|---|
| MAX | 26.04 | 5699. | 7711. | 4054. | 216. | 1414. | 19095. | 238929. |
| SUSTN | 25.00 | 5060. | 5549. | 3538. | 191. | 1147. | 15486. | 201858. |
| ENDUR | 14.00 | 909. | 447. | 766. | 34. | 172. | 2328. | 54182. |

PRINTED REPORT NO. 2 - SPEED-POWER MATRIX

| | |
|---|---|
| RESID RESIST IND | NRC |
| ENDUR DISP IND | AVG DISP |

SPEED AND POWER FOR FULL LOAD DISP
==================================

FULL LOAD WT, LTON 3813.4

| SPEED KT | FRIC | RESID | APPDG | WIND | MARGIN | TOTAL | DRAG LBF |
|---|---|---|---|---|---|---|---|
| | ------------EFFECTIVE HORSEPOWER, HP------------ | | | | | | |
| 2.00 | 3. | 0. | 7. | 0. | 1. | 11. | 1847. |
| 4.00 | 25. | 3. | 35. | 1. | 5. | 70. | 5681. |
| 6.00 | 80. | 18. | 95. | 3. | 16. | 211. | 11447. |
| 8.00 | 185. | 55. | 191. | 6. | 35. | 473. | 19280. |
| 10.00 | 353. | 135. | 333. | 12. | 67. | 901. | 29363. |
| 12.00 | 600. | 281. | 527. | 21. | 114. | 1543. | 41892. |
| 14.00 | 938. | 416. | 765. | 34. | 172. | 2325. | 54128. |
| 16.00 | 1383. | 502. | 1050. | 50. | 239. | 3224. | 65662. |
| 18.00 | 1947. | 836. | 1420. | 71. | 342. | 4617. | 83579. |
| 20.00 | 2645. | 1374. | 1870. | 98. | 479. | 6466. | 105349. |
| 22.00 | 3489. | 2205. | 2410. | 130. | 659. | 8894. | 131736. |
| 24.00 | 4493. | 4040. | 3110. | 169. | 945. | 12757. | 173218. |
| 26.00 | 5671. | 7609. | 4031. | 215. | 1402. | 18929. | 237239. |
| 28.00 | 7036. | 15094. | 5357. | 269. | 2220. | 29977. | 348871. |

SPEED AND POWER FOR AVE ENDUR DISP
==================================

AVE ENDUR DISP, LTON 3591.0

| SPEED KT | FRIC | RESID | APPDG | WIND | MARGIN | TOTAL | DRAG LBF |
|---|---|---|---|---|---|---|---|
| | ------------EFFECTIVE HORSEPOWER, HP------------ | | | | | | |
| 2.00 | 3. | 0. | 7. | 0. | 1. | 11. | 1818. |
| 4.00 | 24. | 3. | 35. | 1. | 5. | 68. | 5573. |
| 6.00 | 78. | 16. | 94. | 3. | 15. | 206. | 11196. |
| 8.00 | 179. | 52. | 190. | 6. | 34. | 462. | 18812. |
| 10.00 | 342. | 127. | 330. | 12. | 65. | 877. | 28587. |
| 12.00 | 581. | 264. | 522. | 22. | 111. | 1499. | 40706. |
| 14.00 | 909. | 447. | 766. | 34. | 172. | 2328. | 54182. |
| 16.00 | 1340. | 664. | 1064. | 51. | 249. | 3368. | 68597. |
| 18.00 | 1886. | 991. | 1430. | 73. | 350. | 4731. | 85647. |
| 20.00 | 2562. | 1512. | 1875. | 100. | 484. | 6533. | 106436. |
| 22.00 | 3380. | 2386. | 2417. | 133. | 665. | 8981. | 133026. |
| 24.00 | 4353. | 4509. | 3142. | 172. | 974. | 13149. | 178535. |
| 26.00 | 5494. | 8078. | 4058. | 219. | 1428. | 19277. | 241605. |
| 28.00 | 6816. | 13845. | 5227. | 273. | 2093. | 28254. | 328822. |

PRINTED REPORT NO. 3 - SHIP GEOMETRIC DATA FOR RESISTANCE COMPUTATIONS

RESID RESIST IND NRC
ENDUR DISP IND AVG DISP

| | FULL LOAD | AVE ENDUR DISP |
|---|---|---|
| BARE HULL DISP, LTON | 3726.8 | 3504.5 |
| APPENDAGE DISP, LTON | 86.6 | 86.6 |
| TOTAL DISP, LTON | 3813.4 | 3591.0 |
| LBP, FT | 380.00 | 380.00 |
| WL LENGTH, FT | 379.79 | 379.53 |
| BEAM AT MAX AREA STA, FT | 50.94 | 50.81 |
| DRAFT AT MAX AREA STA, FT | 15.12 | 14.56 |
| TAYLOR WETTED SURF AREA, FT2 | 19347.1 | 18828.5 |
| SHIP WETTED SURF AREA, FT2 | 19347.1 | 18828.5 |
| SKEG WETTED SURF AREA, FT2 | 700.3 | 700.3 |
| WIND FRONT AREA, FT2 | 1682.9 | 1711.2 |
| | | |
| FROUDE WETTED SURF COEF | 7.2802 | 7.3470 |
| LENGTH-BEAM RATIO | 7.4562 | 7.4689 |

| | | |
|---|---|---|
| BEAM-DRAFT RATIO | 3.3690 | 3.4892 |
| PRISMATIC COEF | 0.5640 | 0.5566 |
| MAX SECTION COEF | 0.7901 | 0.7840 |
| DISP-LENGTH RATIO | 68.0321 | 64.1060 |
| LCB-LENGTH RATIO | 0.5006 | 0.4964 |
| HALF ANG ENTRANCE, DEG | 8.53 | 8.27 |
| HALF ANG RUN, DEG | 10.31 | 27.05 |
| TRANSOM BUTTOCK ANG, DEG | 5.96 | 5.96 |
| BOW SECT AREA COEF | 0.0000 | 0.0000 |
| TRANSOM SECT AREA COEF | 0.0203 | 0.0020 |
| TRANSOM BREADTH COEF | 0.5332 | 0.2111 |
| TRANSOM DEPTH COEF | 0.0484 | 0.0121 |

PRINTED REPORT NO. 4 - APPENDAGE DATA

| | |
|---|---|
| SKEG IND | PRESENT |
| SKEG AREA, FT2 | 350.1 |
| BILGE KEEL IND | PRESENT |
| SHAFT SUPPORT TYPE IND | POD |
| POD STRUT CHORD LGTH, FT | 8.47 |
| POD STRUT THICKNESS, FT | 2.45 |
| POD BARREL LGTH, FT | 24.21 |
| POD BARREL DIA, FT | 7.35 |
| POD STRUT TE OFFSET, FT | 7.65 |
| NO PROP SHAFTS | 2. |
| WET SHAFT LGTH (PORT), FT | 0.00 |
| WET SHAFT LGTH (STBD), FT | 0.00 |
| INTRMDT SHAFT DIA, FT | |
| PROP TYPE IND | FP |
| PROP DIA, FT | 11.58 |
| SONAR DOME IND | NONE |
| SONAR DRAG IND | |
| SONAR SECT AREA, FT2 | |
| NO RUDDERS | 2. |
| RUDDER AREA, FT2 | 120.6 |
| NO FIN PAIRS | 1. |
| ROLL FIN AREA, FT2 | 213.5 |

C,E>RUN,RESI
COMMAND STRING IS:
RUN,RESISTANCE MODULE

ASSET/MONOSC VERSION 3.3+ - RESISTANCE MODULE - 2/11/95 11.12.43.

PRINTED REPORT NO. 1 - SUMMARY

| | | | |
|---|---|---|---|
| RESID RESIST IND | NRC | BILGE KEEL IND | PRESENT |
| FRICTION LINE IND | ITTC | SHAFT SUPPORT TYPE IND | POD |
| ENDUR DISP IND | AVG DISP | PRPLN SYS RESIST IND | CALC |
| ENDUR CONFIG IND | NO TS | PROP TYPE IND | FP |
| SONAR DRAG IND | | SONAR DOME IND | NONE |
| SKEG IND | PRESENT | RUDDER TYPE IND | SPADE |
| FULL LOAD WT, LTON | 3813.4 | CORR ALW | 0.00050 |
| AVG ENDUR DISP, LTON | 3591.0 | DRAG MARGIN FAC | 0.080 |
| USABLE FUEL WT, LTON | 517.1 | TRAILSHAFT PWR FAC | |
| NO RUDDERS | 2. | | |
| NO FIN PAIRS | 1. | PRPLN SYS RESIST FRAC | |
| PROP TIP CLEAR RATIO | 0.25 | MAX SPEED | 0.190 |

| | | | |
|---|---|---|---|
| NO PROP SHAFTS | 2. | SUSTN SPEED | 0.211 |
| PROP DIA, FT | 11.58 | ENDUR SPEED | 0.400 |

| CONDITION | SPEED KT | FRIC | RESID | APPDG | WIND | MARGIN | TOTAL | DRAG LBF |
|---|---|---|---|---|---|---|---|---|
| | | EFFECTIVE HORSEPOWER, HP | | | | | | |
| MAX | 26.04 | 5699. | 7711. | 4054. | 216. | 1414. | 19095. | 238929. |
| SUSTN | 25.00 | 5060. | 5549. | 3538. | 191. | 1147. | 15486. | 201858. |
| ENDUR | 14.00 | 909. | 447. | 766. | 34. | 172. | 2328. | 54182. |

PRINTED REPORT NO. 2 - SPEED-POWER MATRIX

| | |
|---|---|
| RESID RESIST IND | NRC |
| ENDUR DISP IND | AVG DISP |

SPEED AND POWER FOR FULL LOAD DISP

FULL LOAD WT, LTON 3813.4

| SPEED KT | FRIC | RESID | APPDG | WIND | MARGIN | TOTAL | DRAG LBF |
|---|---|---|---|---|---|---|---|
| | EFFECTIVE HORSEPOWER, HP | | | | | | |
| 2.00 | 3. | 0. | 7. | 0. | 1. | 11. | 1847. |
| 4.00 | 25. | 3. | 35. | 1. | 5. | 70. | 5681. |
| 6.00 | 80. | 18. | 95. | 3. | 16. | 211. | 11447. |
| 8.00 | 185. | 55. | 191. | 6. | 35. | 473. | 19280. |
| 10.00 | 353. | 135. | 333. | 12. | 67. | 901. | 29363. |
| 12.00 | 600. | 281. | 527. | 21. | 114. | 1543. | 41892. |
| 14.00 | 938. | 416. | 765. | 34. | 172. | 2325. | 54128. |
| 16.00 | 1383. | 502. | 1050. | 50. | 239. | 3224. | 65662. |
| 18.00 | 1947. | 836. | 1420. | 71. | 342. | 4617. | 83579. |
| 20.00 | 2645. | 1374. | 1870. | 98. | 479. | 6466. | 105349. |
| 22.00 | 3489. | 2205. | 2410. | 130. | 659. | 8894. | 131736. |
| 24.00 | 4493. | 4040. | 3110. | 169. | 945. | 12757. | 173218. |
| 26.00 | 5671. | 7609. | 4031. | 215. | 1402. | 18929. | 237239. |
| 28.00 | 7036. | 15094. | 5357. | 269. | 2220. | 29977. | 348871. |

SPEED AND POWER FOR AVE ENDUR DISP

AVE ENDUR DISP, LTON 3591.0

| SPEED KT | FRIC | RESID | APPDG | WIND | MARGIN | TOTAL | DRAG LBF |
|---|---|---|---|---|---|---|---|
| | EFFECTIVE HORSEPOWER, HP | | | | | | |
| 2.00 | 3. | 0. | 7. | 0. | 1. | 11. | 1818. |
| 4.00 | 24. | 3. | 35. | 1. | 5. | 68. | 5573. |
| 6.00 | 78. | 16. | 94. | 3. | 15. | 206. | 11196. |
| 8.00 | 179. | 52. | 190. | 6. | 34. | 462. | 18812. |
| 10.00 | 342. | 127. | 330. | 12. | 65. | 877. | 28587. |
| 12.00 | 581. | 264. | 522. | 22. | 111. | 1499. | 40706. |
| 14.00 | 909. | 447. | 766. | 34. | 172. | 2328. | 54182. |
| 16.00 | 1340. | 664. | 1064. | 51. | 249. | 3368. | 68597. |
| 18.00 | 1886. | 991. | 1430. | 73. | 350. | 4731. | 85647. |
| 20.00 | 2562. | 1512. | 1875. | 100. | 484. | 6533. | 106436. |
| 22.00 | 3380. | 2386. | 2417. | 133. | 665. | 8981. | 133026. |
| 24.00 | 4353. | 4509. | 3142. | 172. | 974. | 13149. | 178535. |
| 26.00 | 5494. | 8078. | 4058. | 219. | 1428. | 19277. | 241605. |
| 28.00 | 6816. | 13845. | 5227. | 273. | 2093. | 28254. | 328822. |

PRINTED REPORT NO. 3 - SHIP GEOMETRIC DATA FOR RESISTANCE COMPUTATIONS

| | |
|---|---|
| RESID RESIST IND | NRC |
| ENDUR DISP IND | AVG DISP |

| | FULL LOAD | AVE ENDUR DISP |
|---|---|---|
| BARE HULL DISP, LTON | 3726.8 | 3504.5 |
| APPENDAGE DISP, LTON | 86.6 | 86.6 |
| TOTAL DISP, LTON | 3813.4 | 3591.0 |
| LBP, FT | 380.00 | 380.00 |
| WL LENGTH, FT | 379.79 | 379.53 |
| BEAM AT MAX AREA STA, FT | 50.94 | 50.81 |
| DRAFT AT MAX AREA STA, FT | 15.12 | 14.56 |
| TAYLOR WETTED SURF AREA, FT2 | 19347.1 | 18828.5 |
| SHIP WETTED SURF AREA, FT2 | 19347.1 | 18828.5 |
| SKEG WETTED SURF AREA, FT2 | 700.3 | 700.3 |
| WIND FRONT AREA, FT2 | 1682.9 | 1711.2 |
| FROUDE WETTED SURF COEF | 7.2802 | 7.3470 |
| LENGTH-BEAM RATIO | 7.4562 | 7.4689 |
| BEAM-DRAFT RATIO | 3.3690 | 3.4892 |
| PRISMATIC COEF | 0.5640 | 0.5566 |
| MAX SECTION COEF | 0.7901 | 0.7840 |
| DISP-LENGTH RATIO | 68.0321 | 64.1060 |
| LCB-LENGTH RATIO | 0.5006 | 0.4964 |
| HALF ANG ENTRANCE, DEG | 8.53 | 8.27 |
| HALF ANG RUN, DEG | 10.31 | 27.05 |
| TRANSOM BUTTOCK ANG, DEG | 5.96 | 5.96 |
| BOW SECT AREA COEF | 0.0000 | 0.0000 |
| TRANSOM SECT AREA COEF | 0.0203 | 0.0020 |
| TRANSOM BREADTH COEF | 0.5332 | 0.2111 |
| TRANSOM DEPTH COEF | 0.0484 | 0.0121 |

PRINTED REPORT NO. 4 - APPENDAGE DATA

| | |
|---|---|
| SKEG IND | PRESENT |
| SKEG AREA, FT2 | 350.1 |
| BILGE KEEL IND | PRESENT |
| SHAFT SUPPORT TYPE IND | POD |
| POD STRUT CHORD LGTH, FT | 8.47 |
| POD STRUT THICKNESS, FT | 2.45 |
| POD BARREL LGTH, FT | 24.21 |
| POD BARREL DIA, FT | 7.35 |
| POD STRUT TE OFFSET, FT | 7.65 |
| NO PROP SHAFTS | 2. |
| WET SHAFT LGTH (PORT), FT | 0.00 |
| WET SHAFT LGTH (STBD), FT | 0.00 |
| INTRMDT SHAFT DIA, FT | |
| PROP TYPE IND | FP |
| PROP DIA, FT | 11.58 |
| SONAR DOME IND | NONE |
| SONAR DRAG IND | |
| SONAR SECT AREA, FT2 | |
| NO RUDDERS | 2. |
| RUDDER AREA, FT2 | 120.6 |
| NO FIN PAIRS | 1. |
| ROLL FIN AREA, FT2 | 213.5 |

```
C,E>RUN,PROP
COMMAND STRING IS:
  RUN,PROPELLER MODULE
```

ASSET/MONOSC VERSION 3.3+ - PROPELLER MODULE - 2/11/95 11.13.09.

PRINTED REPORT NO. 1 - SUMMARY

| | | | |
|---|---|---|---|
| ENDUR CONFIG IND | NO TS | | |
| PROP TYPE IND | FP | PROP SERIES IND | ANALYTIC |
| PROP DIA IND | CALC | PROP LOC IND | CALC |
| PROP AREA IND | CALC | PROP ID IND | |
| SHAFT SUPPORT TYPE IND | POD | RUDDER TYPE IND | SPADE |
| MAX SPEED, KT | 26.04 | ENDUR SPEED, KT | 14.00 |
| MAX EHP (/SHAFT), HP | 9548. | ENDUR EHP (/SHAFT), HP | 1164. |
| MAX SHP (/SHAFT), HP | 13637. | ENDUR SHP (/SHAFT), HP | 1613. |
| MAX PROP RPM | 220.0 | ENDUR PROP RPM | 111.5 |
| MAX PROP EFF | 0.700 | ENDUR PROP EFF | 0.721 |
| SUSTN SPEED, KT | 25.00 | PROP DIA, FT | 11.58 |
| SUSTN EHP (/SHAFT), HP | 7743. | NO BLADES | 7. |
| SUSTN SHP (/SHAFT), HP | 10928. | PITCH RATIO | 1.27 |
| SUSTN PROP RPM | 206.7 | EXPAND AREA RATIO | 0.890 |
| SUSTN PROP EFF | 0.709 | CAVITATION NO | 1.69 |
| NO PROP SHAFTS | 2.0 | | |
| TOTAL PROPELLER WT, LTON | 13.33 | | |

PRINTED REPORT NO. 2 - PROPELLER CHARACTERISTICS

| | |
|---|---|
| PROP ID IND | |
| NO PROP SHAFTS | 2. |
| PROP DIA, FT | 11.58 |
| NO BLADES | 7. |
| PITCH RATIO | 1.27 |
| EXPAND AREA RATIO | 0.890 |
| THRUST DED COEF | 0.050 |
| TAYLOR WAKE FRAC | 0.050 |
| HULL EFFICIENCY | 1.000 |
| REL ROTATE EFF | 1.000 |

| | ----------- CONDITIONS | ---------- | |
|---|---|---|---|
| CHARACTERISTICS | MAXIMUM | SUSTAINED | ENDURANCE |
| SPEED, KT | 26.04 | 25.00 | 14.00 |
| RPM | 220.0 | 206.7 | 111.5 |
| THRUST/SHAFT, LBF | 125754. | 106242. | 28517. |
| EHP/SHAFT, HP | 9548. | 7743. | 1164. |
| TORQUE/SHAFT, FT-LBF | 325554. | 277711. | 75971. |
| SHP/SHAFT, HP | 13637. | 10928. | 1613. |
| ADVANCE COEF (J) | 0.984 | 1.005 | 1.043 |
| THRUST COEF (KT) | 0.262 | 0.250 | 0.231 |
| TORQUE COEF (10KQ) | 0.585 | 0.565 | 0.531 |
| OPEN WATER EFFY | 0.700 | 0.709 | 0.721 |
| PC | 0.700 | 0.709 | 0.721 |

PRINTED REPORT NO. 3 - CAVITATION CHARACTERISTICS

| | |
|---|---|
| MAX SPEED OF ADV, KT | 24.74 |
| MAX THRUST, LBF | 125754. |
| MAX PROP RPM | 220.0 |
| PROP DIA, FT | 11.58 |
| HUB DEPTH, FT | 12.77 |
| STD CAV NO | 1.69 |
| LOCAL CAV NO (.7R) | 0.28 |
| MEAN THRUST LOADING COEF | 0.17 |
| EXPAND AREA RATIO | 0.890 |

```
MIN EAR REQUIRED              0.890
BACK CAV ALLOWED, PERCENT      10.0


PRINTED REPORT NO. 4 - PROPELLER ARRANGEMENT

PROP DIA, FT                  11.58
FULL LOAD DRAFT, FT           15.12
HUB DEPTH FROM DWL, FT        12.77
LONG LOC FROM AP, FT          34.31
HUB POS FROM CL, FT            8.22
TIP CLR FROM BL, FT           -3.44
TIP CLR FROM MAX HB, FT       13.43
TIP CLR FROM HULL BOT, FT      2.74

TOTAL PROPELLER WT, LTON      13.33
C,E>RUN,MACH
COMMAND STRING IS:
  RUN,MACHINERY MODULE
** WARNING - MACHINERY MODULE ** (W-TORQGOVRNSHDIA-SHSIZN)
PROPELLER SHAFT DIAMETER IS GOVERNED BY TORQUE.
** WARNING - MACHINERY MODULE ** (W-MRDIM2SMALL-MRDIMR)
DIMENSIONS OF THE FOLLOWING MACHINERY ROOMS ARE TOO SMALL
TO ENCLOSE MACHINERY : 2
** WARNING - MACHINERY MODULE ** (W-LT1ENGPERSHAFTE-MHYMSG)
LESS THAN ONE PROPULSION ENGINE PER PROPELLER SHAFT IS OPERATING
AT ENDURANCE (DUE TO SELECTION OF VALUES WITHIN THE  PARAMETER
ELECT PG ARR OP ARRAY). THIS IS NOT CURRENT STANDARD NAVAL PRACTICE.
** WARNING - MACHINERY MODULE ** (W-TOTALSSGENLT3-MHYMSG)
TOTAL NUMBER OF SHIP SERVICE GENERATORS (INCLUDING VSCF, IF ANY),
IS LESS THAN THREE.
** WARNING - MACHINERY MODULE ** (W-ZEROSBYSSGEN-MHYMSG)
NO STANDBY SHIP-SERVICE GENERATORS EXIST AT BATTLE ELECTRICAL
LOADING CONDITION.
** WARNING - MACHINERY MODULE ** (W-OPSSGENENDURLT2-MHYMSG)
NUMBER OF SHIP SERVICE GENERATORS OPERATING AT ENDURANCE CONDITION IS
LESS THAN TWO.

   ASSET/MONOSC VERSION 3.3+ - MACHINERY MODULE - 2/11/95  11.16.47.

PRINTED REPORT NO. 1 - SUMMARY

TRANS TYPE IND                ELECT    MAX SPEED, KT                 26.04
ELECT PRPLN TYPE IND        ACR-DCS    SUSTN SPEED IND               GIVEN
SHAFT SUPPORT TYPE IND          POD    SUSTN SPEED, KT               25.00
NO PROP SHAFTS                   2.    ENDUR SPEED IND               GIVEN
ENDUR CONFIG IND              NO TS    ENDUR SPEED, KT               14.00
SEC ENG USAGE IND                      DESIGN MODE IND           ENDURANCE
MAX MARG ELECT LOAD, KW       2564.    ENDURANCE, NM                 8000.
AVG 24 HR ELECT LOAD, KW      1075.    USABLE FUEL WT, LTON          517.1
SWBS 200 GROUP WT, LTON       272.3    SUSTN SPEED POWER FRAC         0.80
SWBS 300 GROUP WT, LTON       248.0
                                             NO    NO ONLINE   NO ONLINE
ARRANGEMENT OR SS GEN         TYPE      INSTALLED  MAX+SUSTN   ENDURANCE
------------------------   ----------   ---------  ---------   ---------
ELECT PG ARR 1 IND                M-PG      2          2           1
ELECT PG ARR 2 IND                          0          0           0
ELECT DL ARR IND                   MTR      2          2           2
SEP SS GEN                   2738. KW       2          2           1
VSCF SS CYCLO                      KW       0          0           0

                           MAIN ENG         SEC ENG           SS ENG
                       ---------------  ---------------  ---------------
ENG SELECT IND                   GIVEN                             GIVEN
ENG MODEL IND          GE-LM1600-VAN2                           A-12V270
```

| | | | |
|---|---|---|---|
| ENG TYPE IND | RGT | | D DIESEL |
| ENG SIZE IND | CALC | | CALC |
| NO INSTALLED | 2 | 0 | 2 |
| ENG PWR AVAIL, HP | 15108. | | 3820. |
| ENG RPM | 4627.8 | | 900.0 |
| ENG SFC, LBM/HP-HR | 0.347 | | .337 |
| ENG LOAD FRAC | 1.000 | | 1.000 |

PRINTED REPORT NO. 2 - MACHINERY EQUIPMENT LIST

| NO EACH | ITEM | WEIGHT LTON | LENGTH FT | WIDTH FT | HEIGHT FT |
|---|---|---|---|---|---|
| | PROPULSION PLANT | | | | |
| 2 | MAIN ENGINE (BARE) | 1.5 | 9.33 | 4.36 | 4.36 |
| 2 | MAIN ENGINE ENCLOSURE MODULE | 7.8 | 18.48 | 7.86 | 7.16 |
| 2 | MAIN ENGINE INTERCOOLER | 2.0 | 4.37 | 4.94 | 4.94 |
| 0 | SEC ENGINE (BARE) | | | | |
| 0 | SEC ENGINE ENCLOSURE MODULE | | | | |
| 0 | SEC ENGINE INTERCOOLER | | | | |
| 0 | RACER STEAM TURBINE | | | | |
| 0 | RACER CONDENSER | | | | |
| 0 | LTDR GEAR (01) | | | | |
| 0 | EPIC REV PINION GEAR (02) | | | | |
| 0 | FRANCO TOSI REV GEAR (03) | | | | |
| 0 | VSCF COMB/STEP-UP GEAR (04) | | | | |
| 0 | RACER REDUCTION GEAR (05) | | | | |
| 0 | 2 SPD SOLAR EPIC GEAR (06) | | | | |
| 0 | OFFSET GEAR (07) | | | | |
| 0 | OFFSET COMB (2-1) GEAR (08) | | | | |
| 0 | OFFSET COMB (3-2) GEAR (09) | | | | |
| 0 | CR EPIC GEAR (10) | | | | |
| 0 | Z DRIVE SPIRAL BVL GEAR (11) | | | | |
| 0 | PLANETARY REDUCTION GEAR(12) | | | | |
| 0 | CR BI-COUPLED EPIC GEAR (13) | | | | |
| 0 | STAR EPIC REV GEAR (14) | | | | |
| 0 | STAR EPIC REDUCTION GEAR(15) | | | | |
| 0 | COMBINING STEP-UP GEAR (16) | | | | |
| 2 | PROPULSION GENERATOR | 12.9 | 13.34 | 5.34 | 5.34 |
| 2 | PROPULSION MOTOR | 13.9 | 8.46 | 4.42 | 4.42 |
| 2 | THRUST BEARING | 2.8 | 2.39 | 3.34 | 3.34 |
| 2 | PROPELLER SHAFT | | | | |
| | ELECTRIC PLANT | | | | |
| 2 | SS ENGINE (BARE) | 21.0 | 16.29 | 6.21 | 7.84 |
| 0 | SS ENGINE ENCLOSURE MODULE | | | | |
| 0 | SS REDUCTION GEAR (17) | | | | |
| 2 | SEPARATE SS GENERATOR | 12.2 | 6.92 | 5.09 | 6.59 |
| 0 | VSCF SS GENERATOR | | | | |
| 0 | VSCF SS CYCLOCONVERTER | | | | |

PRINTED REPORT NO. 3 - ENGINES

| | MAIN ENG | SEC ENG | SS ENG |
|---|---|---|---|
| ENG SELECT IND | GIVEN | | GIVEN |
| ENG TYPE IND | RGT | | D DIESEL |
| ENG MODEL IND | GE-LM1600-VAN2 | | A-12V270 |
| ENG SIZE IND | CALC | | CALC |
| NO INSTALLED | 2 | 0 | 2 |
| ENG BARE WT, LTON | 1.5 | | 21.0 |
| ENG LENGTH, FT | 9.33 | | 16.29 |
| ENG WIDTH, FT | 4.36 | | 6.21 |
| ENG HEIGHT, FT | 4.36 | | 7.84 |
| ENG PWR AVAIL, HP | 15108. | | 3820.0 |

| | | | |
|---|---|---|---|
| ENG RPM | 4627.8 | | 900.0 |
| ENG MASS FL, LBM/SEC | 70.9 | | 13.2 |
| ENG EXH TEMP, DEGF | 677.5 | | 819.8 |
| ENG SFC EQN IND | POLY QN | | DIESEL |
| ENG SFC, LBM/HP-HR | 0.347 | | .337 |

MAX SPEED CONDITION
-------------------

| | | | |
|---|---|---|---|
| NO OPERATING | 2 | 0 | 2 |
| ENG PWR, HP | 15108. | | 1788.7 |
| ENG RPM | 4627.8 | | 900.0 |
| ENG MASS FL, LBM/SEC | 70.9 | | 9.8 |
| ENG EXH TEMP, DEGF | 677.5 | | 675.6 |
| ENG SFC, LBM/HP-HR | .347 | | .339 |

SUSTN SPEED CONDITION
---------------------

| | | | |
|---|---|---|---|
| NO OPERATING | 2 | 0 | 2 |
| ENG PWR, HP | 12087. | | 1788.7 |
| ENG RPM | 4347.5 | | 900.0 |
| ENG MASS FL, LBM/SEC | 65.0 | | 9.8 |
| ENG EXH TEMP, DEGF | 621.2 | | 675.6 |
| ENG SFC, LBM/HP-HR | .336 | | .339 |

ENDUR SPEED CONDITION
---------------------

| | | | |
|---|---|---|---|
| ENG ENDUR RPM IND | CALC | | |
| NO OPERATING | 1 | 0 | 1 |
| ENG PWR, HP | 3891. | | 1500.0 |
| ENG RPM | 4627.8 | | 900.0 |
| ENG MASS FL, LBM/SEC | 42.0 | | 9.2 |
| ENG EXH TEMP, DEGF | 501.1 | | 658.0 |
| ENG SFC, LBM/HP-HR | .342 | | .345 |

NOTE - ENGINE OPERATING DATA ARE BASED ON USE OF DFM FUEL.

PRINTED REPORT NO. 4 - GEARS

| NO EACH | ITEM | WEIGHT LTON | LENGTH FT | WIDTH FT | HEIGHT FT |
|---|---|---|---|---|---|
| | 2-STAGE REDUCTION GEARS | | | | |
| 0 | LTDR GEAR (01) | | | | |
| 0 | CR BI-COUPLED EPIC GEAR (13) | | | | |
| | 1ST STAGE REDUCTION GEARS | | | | |
| 0 | OFFSET GEAR (07) | | | | |
| 0 | OFFSET COMB (2-1) GEAR (08) | | | | |
| 0 | OFFSET COMB (3-2) GEAR (09) | | | | |
| 0 | STAR EPIC REDUCTION GEAR(15) | | | | |
| | 2ND STAGE REDUCTION GEARS | | | | |
| 0 | CR EPIC GEAR (10) | | | | |
| 0 | PLANETARY REDUCTION GEAR(12) | | | | |
| | SPECIAL GEARS | | | | |
| 0 | EPIC REV PINION GEAR (02) | | | | |
| 0 | FRANCO TOSI REV GEAR (03) | | | | |
| 0 | VSCF COMB/STEP-UP GEAR (04) | | | | |
| 0 | RACER REDUCTION GEAR (05) | | | | |
| 0 | 2 SPD SOLAR EPIC GEAR (06) | | | | |
| 0 | Z DRIVE SPIRAL BVL GEAR (11) | | | | |
| 0 | STAR EPIC REV GEAR (14) | | | | |
| 0 | COMBINING STEP-UP GEAR (16) | | | | |
| 0 | SS REDUCTION GEAR (17) | | | | |

| REDUCTION GEAR DESIGN FACTORS AND DIMENSIONS | 1ST STAGE | 2ND STAGE | SS |
|---|---|---|---|
| REDUCTION RATIO | | | |
| K FACTOR | | | |
| FACE WIDTH RATIO | | | |
| CASING WT FACTOR | | | |
| GEAR FACE WIDTH, FT | | | |
| PINION GEAR DIA, FT | | | |
| REDUCTION GEAR DIA, FT | | | |
| SUN GEAR DIA, FT | | | |
| PLANET GEAR DIA, FT | | | |
| RING GEAR DIA, FT | | | |
| RING GEAR THK, FT | | | |
| NO PLANETS | | | |

PRINTED REPORT NO. 5 - ELECTRIC PROPULSION AND VSCF EQUIPMENT

TRANS TYPE IND-ELECT
ELECT PRPLN TYPE IND-ACR-DCS
SWITCHGEAR TYPE IND-ADV
TRANS LINE NODE PT IND-CALC
ELECT PRPLN RATING IND-CALC

| | |
|---|---|
| TRANS LINE NODE PT X, FT | 258.33 |
| TRANS LINE NODE PT Y, FT | -6.10 |
| TRANS LINE NODE PT Z, FT | 15.00 |

MOTORS AND GENERATORS

| | PRPLN GENERATOR | PRPLN MOTOR | VSCF GENERATOR |
|---|---|---|---|
| INSTALLED NUMBER | 2 | 2 | 0 |
| TYPE | AC | DCS | |
| FREQUENCY CONTROL | NO | | |
| DRIVE | | DIRECT | |
| ROTOR COOLING | AIR | LIQUID | |
| ROTOR TIP SPEED, FT/MIN | 28500. | | |
| STATOR COOLING | LIQUID | LIQUID | |
| ARM ELECT LOAD, AMP/IN | 2400. | | |
| POWER RATING, MW | 14.19 | 10.17 | |
| ROTATIONAL SPEED, RPM | 4628. | 220. | |
| NUMBER OF POLES | 4. | 6. | |
| LENGTH, FT | 13.3 | 8.5 | |
| WIDTH, FT | 5.3 | 4.4 | |
| HEIGHT, FT | 5.3 | 4.4 | |
| WEIGHT, LTON | 12.9 | 13.9 | |

OTHER ELECTRIC PROPULSION AND VSCF EQUIPMENT

| | WEIGHT LTON |
|---|---|
| CONTROLS | 1.4 |
| BRAKING RESISTORS | 2.0 |
| EXCITERS | 7.4 |
| SWITCHGEAR | 1.5 |
| POWER CONVERTERS | .0 |
| DEIONIZED COOL WATER SYS | 13.4 |
| PRPLN TRANS LINE | 36.8 |
| RECTIFIERS | 3.8 |
| HELIUM REFRIGERATION SYS | 4.6 |
| VSCF CYCLOCONVERTERS | .0 |

PRINTED REPORT NO. 6 - SHIP SERVICE GENERATORS

SS SYS TYPE IND-SEP
GEN SIZE IND-NON STD

| | |
|---|---|
| ELECT LOAD DES MARGIN FAC | 0.200 |
| ELECT LOAD SL MARGIN FAC | 0.100 |
| ELECT LOAD IMBAL FAC | 0.900 |
| MAX MARG ELECT LOAD, KW | 2563.6 |
| MAX STANDBY LOAD, KW | 1515.3 |
| 24 HR AVG ELECT LOAD, KW | 1075.0 |

VSCF SS CYCLOCONVERTERS

| CONDITION | NO INSTALL | NO ONLINE | REQ KW/CYCLO | AVAIL KW/CYCLO | LOADING FRAC |
|---|---|---|---|---|---|
| WINTER BATTLE | 0 | 0 | | | 0.000 |
| WINTER CRUISE | 0 | 0 | | | 0.000 |
| SUMMER CRUISE | 0 | 0 | | | 0.000 |
| ENDURANCE(24 HR AVG) | 0 | 0 | | | 0.000 |

SEPARATE SS GENERATORS

| CONDITION | NO INSTALL | NO ONLINE | REQ KW/GEN | AVAIL KW/GEN | LOADING FRAC |
|---|---|---|---|---|---|
| WINTER BATTLE | 2 | 2 | 1282. | 2738. | 0.468 |
| WINTER CRUISE | 2 | 1 | 2464. | 2738. | 0.900 |
| SUMMER CRUISE | 2 | 1 | 1783. | 2738. | 0.651 |
| ENDURANCE(24 HR AVG) | 2 | 1 | 1075. | 2738. | 0.393 |

TOTALS

| CONDITION | REQ KW | AVAIL KW | LOADING FRAC |
|---|---|---|---|
| WINTER BATTLE | 2564. | 5475. | 0.468 |
| WINTER CRUISE | 2464. | 2738. | 0.900 |
| SUMMER CRUISE | 1783. | 2738. | 0.651 |
| ENDURANCE(24 HR AVG) | 1075. | 2738. | 0.393 |

PRINTED REPORT NO. 7 - INTAKE DUCTS

INLET TYPE IND-PLENUM
DUCT SILENCING IND-BOTH
GT ENG ENCL IND-84 DBA

| | MAIN ENG | SEC ENG | SS ENG |
|---|---|---|---|
| ENG TYPE | RGT | | D DIESEL |
| INLET DUCT XSECT AREA,FT2 | 52.1 | .0 | .0 |
| INLET DUCT XSECT LTH, FT | 6.63 | .0 | .0 |
| INLET DUCT XSECT WID, FT | 7.86 | .0 | .0 |

MMR1

| | MAIN ENG WT,LTON | MAIN ENG VCG,FT | SEC ENG WT,LTON | SEC ENG VCG,FT |
|---|---|---|---|---|
| INLET | 0.4 | 36.87 | | |
| INLET DUCTING | 0.8 | 29.72 | | |
| INLET SILENCER | 1.1 | 35.20 | | |
| GT COOLING SUPPLY | 0.8 | 24.57 | | |
| GT BLEED AIR SUPPLY | 2.0 | 21.73 | | |

MMR2

| | MAIN ENG WT,LTON | MAIN ENG VCG,FT | SEC ENG WT,LTON | SEC ENG VCG,FT |
|---|---|---|---|---|
| INLET | 0.4 | 35.27 | | |
| INLET DUCTING | 0.7 | 28.92 | | |
| INLET SILENCER | 1.1 | 35.20 | | |
| GT COOLING SUPPLY | 0.7 | 23.98 | | |
| GT BLEED AIR SUPPLY | 2.0 | 21.31 | | |

NOTE - NUMERIC DATA PRESENTED ABOVE ARE ON A PER ENGINE BASIS.

TRUNK AREA AND VOLUME REQUIREMENTS

| ENGINE CATEGORY | AREA,FT2 HULL | AREA,FT2 DKHS | VOLUME,FT3 HULL | VOLUME,FT3 DKHS |
|---|---|---|---|---|
| MAIN ENGINES | 133.0 | 133.0 | 1330. | 1317. |
| SECONDARY ENGINES | 0.0 | 0.0 | 0. | 0. |
| SHIP-SERVICE ENGINES | 0.0 | 0.0 | 0. | 0. |
| TOTALS | 133.0 | 133.0 | 1330. | 1317. |

PRINTED REPORT NO. 8 - EXHAUST DUCTS

EXHAUST IR SUPPRESS IND-PRESENT
DUCT SILENCING IND-BOTH
GT ENG ENCL IND-84 DBA

| | |
|---|---|
| EXHAUST STACK TEMP, DEGF | 350.0 |
| EDUCTOR DESIGN FAC | 1.000 |

| | MAIN ENG | SEC ENG | SS ENG |
|---|---|---|---|
| ENG TYPE | RGT | | D DIESEL |
| ENG EXH TEMP, DEG | 677. | | 820. |
| ENG MASS FL, LBM/SEC | 70.9 | | 13.2 |
| EXH DUCT GAS TEMP, DEG | 610. | | 820. |
| EXH DUCT GAS DEN, LBM/FT3 | 0.0366 | | .0306 |
| EXH DUCT MASS FL, LBM/SEC | 80.8 | | 13.2 |
| EXH DUCT AREA, FT2 | 20.6 | | 4.0 |

MMR1

| | MAIN ENG WT,LTON | MAIN ENG VCG,FT | SEC ENG WT,LTON | SEC ENG VCG,FT |
|---|---|---|---|---|
| EXH DUCT (TO BOILER/REG) | | | | |
| EXH BOILER (RACER) | | | | |
| EXH REGENERATOR | 11.0 | 22.29 | | |

| | | |
|---|---|---|
| EXH DUCT (TO STACK) | 1.9 | 33.43 |
| EXH SILENCER | 2.9 | 38.03 |
| EXH STACK | 1.0 | 47.17 |
| EXH SPRAY RING | .6 | 32.33 |
| EXH EDUCTOR | 1.6 | 45.63 |

MMR2

| | ----MAIN ENG----- | | -----SEC ENG----- | |
|---|---|---|---|---|
| | WT,LTON | VCG,FT | WT,LTON | VCG,FT |
| EXH DUCT (TO BOILER/REG) | | | | |
| EXH BOILER (RACER) | | | | |
| EXH REGENERATOR | 11.0 | 22.29 | | |
| EXH DUCT (TO STACK) | 1.7 | 32.63 | | |
| EXH SILENCER | 2.9 | 38.03 | | |
| EXH STACK | 1.0 | 45.57 | | |
| EXH SPRAY RING | .6 | 31.26 | | |
| EXH EDUCTOR | 1.6 | 44.03 | | |

NOTE - NUMERIC DATA PRESENTED ABOVE ARE ON A PER ENGINE BASIS.

TRUNK AREA AND VOLUME REQUIREMENTS

| | -----AREA,FT2---- | | ---VOLUME,FT3---- | |
|---|---|---|---|---|
| ENGINE CATEGORY | HULL | DKHS | HULL | DKHS |
| MAIN ENGINES | 332.4 | 177.1 | 3324. | 1753. |
| SECONDARY ENGINES | 0.0 | 0.0 | 0. | 0. |
| SHIP-SERVICE ENGINES | 68.0 | 68.0 | 680. | 672. |
| TOTALS | 400.4 | 245.1 | 4004. | 2425. |

PRINTED REPORT NO. 9 - PROPELLERS AND SHAFTS

SHAFT SUPPORT TYPE IND-POD
SHAFT SYS SIZE IND-CALC
PROP TYPE IND-FP

| | |
|---|---|
| PROP DIA, FT | 11.58 |
| HUB DIA, FT | 4.86 |
| PROP BLADE WT, LTON | 3.1 |
| PROP HUB WT, LTON | 3.6 |
| BEND STRESS CON FAC | 1.000 |
| OVRHG PROP MOM ARM RATIO | 0.340 |
| EQUIV FP PROP WT, LTON | 6.7 |
| ALLOW BEND STRESS, LBF/IN2 | 6000. |
| FATIGUE LIMIT, LBF/IN2 | 47500. |
| YIELD POINT, LBF/IN2 | 75000. |
| TORQUE MARGIN FAC | 1.200 |
| OFF-CENTER THRUST FAC | 1.000 |
| NO STRUTS PER SHAFT | 0 |

PORT SHAFT

| | PROP SECTION | INTERMED SECTION | LINE SECTION |
|---|---|---|---|
| ANGLE, DEG | -5.85 | | |
| LENGTH, FT | 2.89 | | |
| DIAMETER, FT | 1.21 | | |
| BORE RATIO | .550 | | |
| WEIGHT, LTON | .7 | | |
| LCG, FT | 348.28 | | |

| | |
|---|---|
| TCG, FT | -8.22 |
| VCG, FT | 2.62 |
| FACTOR OF SAFETY | |

STBD SHAFT

| | PROP SECTION | INTERMED SECTION | LINE SECTION |
|---|---|---|---|
| ANGLE, DEG | -5.85 | | |
| LENGTH, FT | 2.89 | | |
| DIAMETER, FT | 1.21 | | |
| BORE RATIO | .550 | | |
| WEIGHT, LTON | .7 | | |
| LCG, FT | 348.28 | | |
| TCG, FT | 8.22 | | |
| VCG, FT | 2.62 | | |
| FACTOR OF SAFETY | | | |

PRINTED REPORT NO. 10 - STRUTS, PODS, AND RUDDERS

SHAFT SUPPORT TYPE IND-POD
SHAFT SYS SIZE IND-CALC

| | |
|---|---|
| PROP DIA, FT | 11.58 |
| NO STRUTS PER SHAFT | 0 |
| NO SHAFTS | 2 |
| OVRHG PROP MOM ARM RATIO | 0.340 |

STRUTS

| | MAIN STRUT | INTERMED STRUT |
|---|---|---|
| WALL THICKNESS, FT | | |
| CHORD, FT | | |
| THICKNESS, FT | | |
| BARREL LTH, FT | | |
| BARREL DIA, FT | | |

PODS

| | |
|---|---|
| STRUT WALL THICKNESS, FT | .05 |
| STRUT CHORD, FT | 8.47 |
| STRUT THICKNESS, FT | 2.45 |
| BARREL LTH, FT | 24.21 |
| BARREL DIA, FT | 7.35 |

RUDDERS

RUDDER TYPE IND-SPADE
RUDDER SIZE IND-CALC

| | |
|---|---|
| NO RUDDERS | 2. |
| RUDDER WT (PER), LTON | 13.8 |
| RUDDER DISP (PER), LTON | 2.6 |

| | CHORD,FT | THICK,FT | SPAN,FT |
|---|---|---|---|
| SPADE RUDDER | 9.96 | 1.11 | 12.11 |

PRINTED REPORT NO. 11 - ELECTRIC LOADS

400 HZ ELECT LOAD FAC 0.200

| PAYLOAD LOADS | WINTER CRUISE KW | WINTER BATTLE KW | SUMMER CRUISE KW |
|---|---|---|---|
| COMMAND AND SURVEILLANCE (60 HZ) | 86.1 | 441.6 | 86.1 |
| COMMAND AND SURVEILLANCE (400 HZ) | 21.5 | 110.4 | 21.5 |
| ARMAMENT (60 HZ) | 8.0 | 49.6 | 8.0 |
| ARMAMENT (400 HZ) | 2.0 | 12.4 | 2.0 |
| OTHER PAYLOAD (60 HZ) | 0.0 | 0.0 | 0.0 |
| OTHER PAYLOAD (400 HZ) | 0.0 | 0.0 | 0.0 |
| SUB-TOTAL | 117.6 | 614.0 | 117.6 |

NON-PAYLOAD LOADS (* INDICATES USER ADJUSTED VALUE)

| | | | |
|---|---|---|---|
| PROPULSION AND STEERING | 255.4 | 283.4 | 194.0 |
| LIGHTING | 101.0 | 99.0 | 101.0 |
| MISCELLANEOUS ELECTRIC | 46.1 | 40.1 | 46.1 |
| HEATING | 598.3 | 305.1 | 29.9 |
| VENTILATION | 234.9 | 180.9 | 234.9 |
| AIR CONDITIONING | 220.6 | 207.4 | 329.2 |
| AUXILIARY BOILER AND FRESH WATER | 114.7 | 84.9 | 114.7 |
| FIREMAIN | 49.2 | 69.4 | 49.2 |
| UNREP AND HANDLING | 7.7 | 12.9* | 7.7 |
| MISC AUXILIARY MACHINERY | 101.6 | 56.9 | 101.6 |
| SERVICES AND WORK SPACES | 42.7 | 14.1 | 42.7 |
| SUBTOTAL | 1772.1 | 1353.9 | 1251.0 |
| TOTAL | 1889.7 | 1967.9 | 1368.6 |
| TOTAL (INCLUDING MARGINS) | 2463.8 | 2563.6 | 1783.3 |

| | |
|---|---|
| MAX MARG ELECT LOAD | 2563.6 |
| 24 HR AVG ELECT LOAD | 1075.0 |
| CONNECTED ELECT LOAD | 5215.0 |
| ANCHOR ELECT LOAD | 1515.3 |
| VITAL ELECT LOAD | 993.2 |
| EMERGENCY ELECT LOAD | 607.5 |
| MAX STBY ELECT LOAD | 1515.3 |

PRINTED REPORT NO. 12 - POWERING

SUSTN SPEED IND-GIVEN
ENDUR SPEED IND-GIVEN
TRANS EFF IND-CALC
100 PCT POWER TRANS EFF 0.9026
25 PCT POWER TRANS EFF 0.9124

| | MAX SPEED | SUSTN SPEED | ENDUR SPEED |
|---|---|---|---|
| SHIP SPEED, KT | 26.04 | 25.00 | 14.00 |
| PROP RPM | 220.0 | 206.7 | 111.5 |
| NO OP PROP SHAFTS | 2 | 2 | 2 |
| EHP (/SHAFT), HP | 9548. | 7743. | 1164. |
| PROPULSIVE COEF | 0.700 | 0.709 | 0.721 |
| ENDUR PWR ALW | 1.0 | 1.0 | 1.1 |
| SHP (/SHAFT), HP | 13637. | 10928. | 1775. |
| TRANS EFFY | 0.903 | 0.904 | 0.912 |
| CP PROP TRANS EFFY MULT | 1.000 | 1.000 | 1.000 |
| PROPUL PWR (/SHAFT); HP | 15108. | 12087. | 1945. |
| PD GEN PWR (/SHAFT), HP | 0. | 0. | 0. |
| BHP (/SHAFT), HP | 15108. | 12087. | 1945. |

PRINTED REPORT NO. 13 - HULL STRUCTURE AND MISCELLANEOUS WEIGHT

| SWBS | COMPONENT | WT,LTON | LCG,FT | VCG,FT |
|---|---|---|---|---|
| 160 | SPECIAL STRUCTURES | | | |
| 161 | CASTINGS, FORGINGS, AND WELDMENTS | 31.4 | 267.80 | 9.30 |
| 162 | STACKS AND MASTS | 2.1 | 202.67 | 46.37 |
| 180 | FOUNDATIONS | | | |
| 182 | PROPULSION PLANT FOUNDATIONS | 90.3 | 250.18 | 7.47 |
| 183 | ELECTRIC PLANT FOUNDATIONS | 43.8 | 195.19 | 12.82 |

* DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS

PRINTED REPORT NO. 14 - PROPULSION PLANT WEIGHT

| SWBS | COMPONENT | WT,LTON | LCG,FT | VCG,FT |
|---|---|---|---|---|
| 200 | PROPULSION PLANT | 272.3 | 247.04 | 13.40 |
| 210 | ENERGY GENERATING SYSTEM (NUCLEAR) | 0.0 | 0.00 | 0.00 |
| 220 | ENERGY GENERATING SYSTEM (NON-NUCLEAR) | 0.0 | 0.00 | 0.00 |
| 230 | PROPULSION UNITS | 181.3 | 254.06 | 12.17 |
| 233 | PROPULSION INTERNAL COMBUSTION ENGINES | 0.0 | 0.00 | 0.00 |
| 234 | PROPULSION GAS TURBINES | 58.2 | 196.74 | 17.33 |
| 235 | ELECTRIC PROPULSION | 123.1 | 281.14 | 9.73 |
| 240 | TRANSMISSION AND PROPULSOR SYSTEMS | 20.6 | 347.32 | 2.52 |
| 241 | PROPULSION REDUCTION GEARS | 0.0 | 0.00 | 0.00 |
| 242 | PROPULSION CLUTCHES AND COUPLINGS | 0.0 | 0.00 | 0.00 |
| 243 | PROPULSION SHAFTING | 1.4 | 348.28 | 2.62 |
| 244 | PROPULSION SHAFT BEARINGS | 5.9 | 350.79 | 2.88 |
| 245 | PROPULSORS | 13.3 | 345.69 | 2.35 |
| 250 | PRPLN SUPPORT SYS (EXCEPT FUEL+LUBE OIL) | 35.0 | 199.33 | 28.20 |
| 251 | COMBUSTION AIR SYSTEM | 10.0 | 188.31 | 27.25 |
| 252 | PROPULSION CONTROL SYSTEM | 8.9 | 196.74 | 19.50 |
| 256 | CIRCULATING AND COOLING SEA WATER SYSTEM | 2.4 | 239.40 | 10.80 |
| 259 | UPTAKES (INNER CASING) | 13.6 | 201.98 | 37.76 |
| 260 | PRPLN SUPPORT SYS (FUEL+LUBE OIL) | 23.4 | 188.42 | 12.42 |
| 261 | FUEL SERVICE SYSTEM | 9.4 | 177.74 | 11.33 |
| 262 | MAIN PROPULSION LUBE OIL SYSTEM | 10.0 | 196.74 | 12.00 |
| 264 | LUBE OIL FILL, TRANSFER, AND PURIF | 4.0 | 192.74 | 16.00 |
| 290 | SPECIAL PURPOSE SYSTEMS | 12.0 | 222.28 | 9.53 |
| 298 | OPERATING FLUIDS | 9.0 | 228.00 | 8.00 |
| 299 | REPAIR PARTS AND SPECIAL TOOLS | 3.0 | 205.20 | 14.10 |

* DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS

PRINTED REPORT NO. 15 - ELECTRIC PLANT WEIGHT

| SWBS | COMPONENT | WT,LTON | LCG,FT | VCG,FT |
|---|---|---|---|---|
| 300 | ELECTRIC PLANT | 248.0 | 199.42 | 16.82 |
| 310 | ELECTRIC POWER GENERATION | 121.9 | 195.11 | 12.01 |
| 311 | SHIP SERVICE POWER GENERATION | 89.8 | 197.08 | 12.00 |
| 313 | BATTERIES AND SERVICE FACILITIES | 22.8 | 197.08 | 6.00 |
| 314 | POWER CONVERSION EQUIPMENT | 9.2 | 171.00 | 27.00 |
| 320 | POWER DISTRIBUTION SYSTEMS | 51.7 | 204.24 | 24.76 |
| 321 | SHIP SERVICE POWER CABLE | 32.4 | 201.40 | 27.00 |
| 324 | SWITCHGEAR AND PANELS | 19.3 | 209.00 | 21.00 |
| 330 | LIGHTING SYSTEM | 18.7 | 200.00 | 27.22 |
| 331 | LIGHTING DISTRIBUTION | 11.8 | 201.40 | 27.00 |
| 332 | LIGHTING FIXTURES | 6.9 | 197.60 | 27.60 |
| 340 | POWER GENERATION SUPPORT SYSTEMS | 37.7 | 195.27 | 17.56 |
| 342 | DIESEL SUPPORT SYSTEMS | 37.7 | 195.27 | 17.56 |
| 343 | TURBINE SUPPORT SYSTEMS | 0.0 | 0.00 | 0.00 |
| 390 | SPECIAL PURPOSE SYSTEMS | 18.0 | 222.86 | 14.25 |

| | | | | |
|---|---|---|---|---|
| 398 | OPERATING FLUIDS | 13.5 | 197.08 | 12.00 |
| 399 | REPAIR PARTS AND SPECIAL TOOLS | 4.5 | 300.20 | 21.00 |

* DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS

PRINTED REPORT NO. 16 - MACHINERY ROOMS

| | |
|---|---|
| NO MAIN MACHINERY ROOMS | 2 |
| NO AUX MACHINERY ROOMS | 0 |
| NO OTHER MACHINERY ROOMS | 0 |

BULKHEAD LOCATIONS

| MR NO | MR ID | FWD BHD BHD NO | FWD BHD X, FT | FWD BHD X/LBP | AFT BHD BHD NO | AFT BHD X, FT | AFT BHD X/LBP |
|---|---|---|---|---|---|---|---|
| 1 | MMR1 | 6. | 137.82 | 0.363 | 7. | 172.65 | 0.454 |
| 2 | MMR2 | 9. | 231.17 | 0.608 | 10. | 266.00 | 0.700 |

DIMENSIONS

| MR NO | MR ID | LENGTH, FT AVAIL | LENGTH, FT REQ | WIDTH, FT AVAIL | WIDTH, FT REQ | HEIGHT, FT AVAIL | HEIGHT, FT REQ |
|---|---|---|---|---|---|---|---|
| 1 | MMR1 | 34.83 | 34.83 | 49.25 | 21.06 | 21.25 | 19.58 |
| 2 | MMR2 | 34.83 | 34.83 | 51.72 | 21.06 | 19.46 | 19.58 |

ARRANGEMENTS

| MR NO | MR ID | ROTATION ANGLE,DEG |
|---|---|---|
| 1 | MMR1 | 0.00 |
| 2 | MMR2 | 0.00 |

PRINTED REPORT NO. 17 - MACHINERY ARRANGEMENTS

CLEARANCES (MACHINERY TO MACHINERY)

| | |
|---|---|
| ENG TO ENG CLR, FT | 1.00 |
| ENG TO GEAR CLR, FT OR ENG TO GEN CLR OR GEAR TO GEN CLR | 1.00 |
| MTR TO GEAR CLR, FT | 2.50 |
| PRPLN ARR TO SS ARR CLR, FT | 6.00 |
| AISLE WIDTH CLR, FT | 2.50 |
| PORT/CL TB TO GEAR CLR, FT | .00 |
| STBD TB TO GEAR CLR, FT | .00 |

SEPARATIONS (BETWEEN HULL AND MACHINERY)

| | |
|---|---|
| LONG (TO BHD), FT | 1.00 |
| TRANS (TO SIDE SHELL), FT | 1.00 |
| VERT (TO HULL BOT), FT | 1.00 |
| RADIAL (TO POD), FT | 1.00 |

ARRANGEMENTS

| ARRANGEMENT | TYPE | NO INSTALLED | NO ONLINE MAX+SUSTN | NO ONLINE ENDURANCE |
|---|---|---|---|---|
| ELECT PG ARR 1 IND | M-PG | 2 | 2 | 1 |
| ELECT PG ARR 2 IND | | 0 | 0 | 0 |
| ELECT DL ARR IND | MTR | 2 | 2 | 2 |
| SHIP SERVICE ARR | DIESEL | 2 | 2 | 1 |

MACHINERY COMPONENT LOCATIONS

| COMPONENT | MR ID | CG LOC, FT X | Y | Z |
|---|---|---|---|---|
| MAIN ENG | MMR1 | 148.06 | -6.10 | 15.00 |
| MAIN ENG | MMR2 | 241.41 | -6.10 | 15.00 |
| SS ENG | MMR1 | 146.97 | 6.93 | 12.00 |
| SS ENG | MMR2 | 240.32 | 6.93 | 12.00 |
| PRPLN MTR | | 356.30 | -8.22 | 3.44 |
| PRPLN MTR | | 356.30 | 8.22 | 3.44 |

SHAFTING

| SHAFT TYPE | END POINT LOC, FT X | Y | Z | SHAFT ANGLE, DEG |
|---|---|---|---|---|
| PORT SHAFT | 349.72 | -8.22 | 2.77 | -5.85 |
| STBD SHAFT | 349.72 | 8.22 | 2.77 | -5.85 |

PRINTED REPORT NO. 18 - MACHINERY SPACE REQUIREMENTS

MACHINERY ROOM VOLUME REQUIREMENTS

| VOLUME CATEGORY | VOLUME, FT3 |
|---|---|
| SWBS GROUP 200 | 71423. |
| PROPULSION POWER GENERATION | 13512. |
| PROPULSION ENGINES | 8846. |
| PROPULSION REDUCTION GEARS AND GENERATORS | 4666. |
| DRIVELINE MACHINERY | 0. |
| REDUCTION AND BEVEL GEARS WITH Z-DRIVE | 0. |
| ELECTRIC PROPULSION MOTORS AND GEARS | 0. |
| REMOTELY-LOCATED THRUST BEARINGS | 0. |
| PROPELLER SHAFT | 0. |
| ELECTRIC PROPULSION MISCELLANEOUS EQUIPMENT | 9916. |
| CONTROLS | 1489. |
| BRAKING RESISTORS | 771. |
| MOTOR AND GENERATOR EXCITERS | 1489. |
| SWITCHGEAR | 726. |
| POWER CONVERTERS | 669. |
| DEIONIZED COOLING WATER SYSTEMS | 2352. |
| RECTIFIERS | 548. |
| HELIUM REFRIGERATION SYSTEMS | 1872. |
| PROPULSION AUXILIARIES | 47995. |
| PROPULSION LOCAL CONTROL CONSOLES | 3601. |
| CP PROP HYDRAULIC OIL POWER MODULES | 0. |
| FUEL OIL PUMPS | 24465. |
| LUBE OIL PUMPS | 2590. |
| LUBE OIL PURIFIERS | 15269. |
| ENGINE LUBE OIL CONDITIONERS | 599. |
| SEAWATER COOLING PUMPS | 1470. |
| SWBS GROUP 300 | 23987. |
| ELECTRIC PLANT POWER GENERATION | 9898. |
| ELECTRIC PLANT ENGINES | 6130. |
| ELECTRIC PLANT GENERATORS AND GEARS | 3768. |
| SHIP SERVICE SWITCHBOARDS | 14089. |
| CYCLOCONVERTERS | 0. |
| SWBS GROUP 500 | 40613. |
| AUXILIARY MACHINERY | 40613. |
| AIR CONDITIONING PLANTS | 7395. |
| AUXILIARY BOILERS | 1135. |

| | |
|---|---|
| FIRE PUMPS | 2427. |
| DISTILLING PLANTS | 10881. |
| AIR COMPRESSORS | 5895. |
| ROLL FIN PAIRS | 10305. |
| SEWAGE PLANTS | 2576. |

ARRANGEABLE AREA REQUIREMENTS

| SSCS | GROUP NAME | FT2 HULL/DKHS | FT2 DKHS ONLY |
|---|---|---|---|
| 4.31 | AUXILIARY MACHINERY DELTA | 8258.6 | 0.0 |
| 4.3311 | SHIP SERVICE POWER GENERATION | 0.0 | 0.0 |
| 4.132 | INTERNAL COMB ENG COMB AIR | 0.0 | 0.0 |
| 4.133 | INTERNAL COMB ENG EXHAUST | 68.0 | 68.0 |
| 4.142 | GAS TURBINE ENG COMB AIR | 133.0 | 133.0 |
| 4.143 | GAS TURBINE ENG EXHAUST | 332.4 | 177.1 |

NOTE: * DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS

PRINTED REPORT NO. 19 - SURFACE SHIP ENDURANCE CALCULATION FORM

DESIGN MODE IND-ENDURANCE
ENDUR DISP IND-AVG DISP
ENDUR DEF IND-USN
SHIP FUEL TYPE IND-JP-5

ENG ENDUR RPM IND-CALC

SHIP FUEL LHV, BTU/LBM 18300.
DFM FUEL LHV, BTU/LBM 18360.

| | | |
|---|---|---|
| (1) | ENDURANCE REQUIRED, NM | 8000. |
| (2) | ENDURANCE SPEED, KT | 14.00 |
| (3) | FULL LOAD DISPLACEMENT, LTON | 3813.4 |
| (3A) | AVERAGE ENDURANCE DISPLACEMENT, LTON | 3591.0 |
| (4) | RATED FULL POWER SHP, HP | 27273. |
| (5) | DESIGN ENDURANCE POWER SHP @ (2)&(3A), HP | 3227. |
| (6) | AVERAGE ENDURANCE POWER (SHP), HP<br>(5) X 1.10 | 3550. |
| (7) | RATIO, AVG END SHP/RATED F.P. SHP<br>(6)/(4) | 0.13015 |
| (8) | AVERAGE ENDURANCE BHP, HP<br>(8A)+(8B) | 3891. |
| (8A) | AVERAGE PRPLN ENDURANCE BHP, HP<br>(6)/TRANSMISSION EFFICIENCY | 3891. |
| (8B) | SHIP SERV PWR SUPPLIED BY PRPLN ENG, HP | 0. |
| (9) | 24 HOUR AVERAGE ELECTRIC LOAD, KW | 1075. |
| (9A) | 24 HOUR AVERAGE ELECTRIC LOAD PORTION<br>SUPPLIED BY SS ENG, KW | 1075. |
| (10) | CALCULATED PROPULSION FUEL RATE @(8), LBM/HP-HR | 0.342 |
| (11) | CALC PRPLN FUEL CONSUMPTION, LBM/HR<br>(10)X(8) | 1332.1 |
| (12) | CALC SS GEN FUEL RATE @ (9A), LBM/KW-HR | 0.482 |
| (13) | CALC SS GEN FUEL CONSUMPTION, LBM/HR<br>(12)X(9A) | 518.0 |
| (14) | CALC FUEL CONSUMPTION FOR OTHER SERVICES, LBM/HR | 0.0 |
| (15) | TOTAL CALC ALL-PURPOSE FUEL CONSUMPTION, LBM/HR<br>(11)+(13)+14) | 1850.1 |
| (16) | CALC ALL-PURPOSE FUEL RATE, LBM/HP-HR<br>(15)/(6) | 0.521 |
| (17) | FUEL RATE CORRECTION FACTOR BASED ON (7) | 1.0400 |
| (18) | SPECIFIED FUEL RATE, LBM/HP-HR<br>(16)X(17) | 0.542 |

| | | |
|---|---|---|
| (19) | AVG ENDURANCE FUEL RATE, LBM/HP-HR (18)X1.05 | 0.569 |
| (20) | ENDURANCE FUEL (BURNABLE), LTON (1)X(6)X(19)/(2)X2240 | 517.1 * |
| (21) | TAILPIPE ALLOWANCE FACTOR | 0.95 |
| (22) | ENDURANCE FUEL LOAD, LTON (20)/(21) | 544.3 |

ENG ENDUR RPM IND- pk[illegible]?

PRINTED REPORT NO. 20 - MACHINERY MARGINS

PROPULSION PLANT

| | |
|---|---|
| MAIN ENG MAX LOAD FRAC | 1.000 |
| SEC ENG MAX LOAD FRAC | |
| TORQUE MARGIN FAC | 1.200 |

ELECTRIC PLANT

| | |
|---|---|
| SS ENG MAX LOAD FRAC | 1.000 |
| ELECT LOAD DES MARGIN FAC | 0.200 |
| ELECT LOAD SL MARGIN FAC | 0.100 |
| ELECT LOAD IMBAL FAC | 0.900 |

C,E>RUN,AUX
COMMAND STRING IS:
RUN,AUXILIARY SYS MODULE

ASSET/MONOSC VERSION 3.3+ - AUXILIARY SYS MODULE - 2/11/95 11.18.11.

PRINTED REPORT NO. 1 - SUMMARY

| | |
|---|---|
| LBP,FT | 380.0 |
| BEAM,FT | 51.0 |
| TOTAL AREA,FT2 | 39839. |
| TOTAL VOLUME,FT3 | 491932. |
| USABLE FUEL WT,LTON | 517.1 |
| FULL LOAD WT,LTON | 3813.4 |
| MAX SHP, HP | 30217. |

SEP GEN: 5475.0 KW

| | |
|---|---|
| TOTAL ACCOM | 122.0 |
| COLL PROT SYS IND | PRESENT |
| COMP HTR TYPE IND | ELECTRIC |
| DISTILLER TYPE IND | RE OSMOSIS |
| WATER HTR TYPE IND | INSTANT |
| ANCHOR LOC IND | BOTTOM |
| PRAIRIE SYS IND | PRESENT |
| MASKER SYS IND | PRESENT |

| | |
|---|---|
| TOTAL AIRCOND LOAD, TON | 164.6 |
| NO AIRCOND UNITS | 3.0 |
| TOTAL AIRCOND CAP, TON | 255.0 |
| SWBS 514 WT,LTON | 55.7 |

| | |
|---|---|
| TOTAL STEAM LOAD, LB/HR | 110. |
| AUX BOILER TYPE IND | ELECTRIC |
| NO AUX BOILERS | 2. |
| TOTAL AUX BLR CAP, LB/HR | 200. |
| SWBS 517 WT,LTON | 0.3 |

| | |
|---|---|
| BOAT SELECT IND | GIVEN |
| BOAT TYPE IND | MIXED |
| BOAT COMPLEMENT | 2 RIB+UB/UB |
| SWBS 583 WT,LTON | 35.6 |

NO FAS STATIONS 2.

| RAS STATIONS: | NO | TYPE |
|---|---|---|
| | 2. | |

BULKHEAD

| STRIKE GEAR: | NO | TYPE |
|---|---|---|
| | 2. | PALLET |

| | |
|---|---|
| SSCS 3.53 AREA,FT2 | 212.9 |
| SWBS 571 WT,LTON | 10.7 |

| | |
|---|---|
| STRK DECK AREA,FT2 | 472.2 |
| SWBS 572 WT,LTON | 35.1 |

| | |
|---|---|
| STOWAGE AREA,FT2 | 2299.7 |
| SWBS 671 WT,LTON | 4.0 |
| SWBS 672 WT,LTON | 25.3 |

PRINTED REPORT NO. 2- AIRCONDITIONING

| | | | |
|---|---|---|---|
| AIRCOND MARGIN | 0.20 | TOTAL ACCOM | 122.0 |
| SHIP AIRCOND LOAD, TON | 137.1 | COLL PROT SYS IND | PRESENT |
| AIRCOND MARGIN LOAD, TON | 27.4 | | |
| TOTAL AIRCOND LOAD, TON | 164.6 | SWBS 514 WT,LTON | 55.7 |
| AIRCOND UNIT CAP, TON | 85.0 | SWBS 514 VCG,FT | 17.1 |
| NO AIRCOND UNITS | 3.0 | | |
| TOTAL AIRCOND CAP, TON | 255.0 | | |

PRINTED REPORT NO. 3- AUXILIARY BOILERS

| | | | |
|---|---|---|---|
| AUX BOILER TYPE IND | ELECTRIC | TOTAL ACCOM | 122.0 |
| NO AUX BOILERS | 2. | COLL PROT SYS IND | PRESENT |
| AUX BLR UNIT CAP, LB/HR | 100. | COMP HTR TYPE IND | ELECTRIC |
| TOTAL AUX BLR CAP, LB/HR | 200. | DISTILLER TYPE IND | RE OSMOSIS |
| SWBS 261 STEAM LOAD | 818. | SWBS 517 WT,LTON | 55.7 |
| SWBS 264 STEAM LOAD | 30. | SWBS 517 VCG,FT | 17.1 |
| SWBS 511 STEAM LOAD | 0. | | |
| SWBS 517 STEAM LOAD | 134. | | |
| SWBS 531 STEAM LOAD | 0. | | |
| SWBS 533 STEAM LOAD | 933. | | |
| SWBS 541 STEAM LOAD | 573. | | |
| SWBS 651 STEAM LOAD | 49. | | |
| SWBS 655 STEAM LOAD | 61. | | |
| | --------- | | |
| TOTAL STEAM LOAD, LB/HR | 110. | | |

PRINTED REPORT NO. 4- BOATS

| | | | |
|---|---|---|---|
| BOAT SELECT IND | GIVEN | BOAT COMP WT,LTON | 33.7 |
| BOAT TYPE IND | MIXED | | |
| BOAT COMPLEMENT | 2 RIB+UB/UB | SWBS 583 WT,LTON | 35.6 |
| | | SWBS 583 VCG,FT | 39.0 |

PRINTED REPORT NO. 5- REPLENISHMENT SYSTEMS

| | |
|---|---|
| NO FAS STATIONS | 2. |
| FAS STATION WT,LTON | 0.5 |

| RAS STATIONS: | NO | TYPE |
|---|---|---|
| | 2. | BULKHEAD |

| | | | |
|---|---|---|---|
| RAS STATION WT,LTON | 10.2 | DKHS ONLY AREA,FT2 | 212.9 |
| RAS STATION VCG,FT | 37.0 | SSCS 3.53 AREA,FT2 | 212.9 |
| SWBS 571 WT,LTON | 10.7 | | |
| SWBS 571 VCG,FT | 36.8 | | |

PRINTED REPORT NO. 6- STRIKE GEAR

| STRIKE GEAR: | NO | TYPE |
|---|---|---|
| | 2. | PALLET |

| | |
|---|---|
| STRK DECK AREA,FT2 | 472.2 |
| SWBS 572 WT,LTON | 35.1 |
| SWBS 572 VCG,FT | 23.9 |

PRINTED REPORT NO. 7- STOWAGE SYSTEMS

STOWAGE SSCS SPACES AND ASSOCIATED FACTORS

| SSCS SPACES | STOW UTIL FACTOR | STOW EFF FACTOR | DECK LOAD LB/FT2 | STACK HEIGHT,FT |
|---|---|---|---|---|
| A1390 | 0.36 | 0.45 | 25.00 | 6.50 |
| A2230 | 1.00 | 0.50 | 3.70 | 6.50 |

| | | | | |
|---|---|---|---|---|
| A2410 | 0.67 | 0.47 | 14.70 | 6.50 |
| A2620 | 0.58 | 0.45 | 14.70 | 6.50 |
| A3700 | 0.54 | 0.45 | 32.10 | 6.50 |

| | |
|---|---|
| STOWAGE AREA,FT2 | 2299.7 |
| SWBS 671 WT,LTON | 4.0 |
| SWBS 671 VCG,FT | 22.3 |
| SWBS 672 WT,LTON | 25.3 |
| SWBS 672 VCG,FT | 14.1 |

PRINTED REPORT NO. 8 - AUXILIARY SYSTEMS WEIGHT

| SWBS | COMPONENT | WT-LTON | VCG-FT |
|---|---|---|---|
| *500 | AUXILIARY SYSTEMS, GENERAL | 516.9 | 20.39 |
| 510 | CLIMATE CONTROL | 114.3 | 23.01 |
| 511 | COMPARTMENT HEATING SYSTEM | 4.4 | 25.65 |
| 512 | VENTILATION SYSTEM | 43.4 | 28.77 |
| 513 | MACHINERY SPACE VENT SYSTEM | 8.7 | 32.71 |
| 514 | AIR CONDITIONING SYSTEM | 55.7 | 17.12 |
| 516 | REFRIGERATION SYSTEM | 1.9 | 14.86 |
| 517 | AUX BOILERS+OTHER HEAT SOURCES | .3 | 17.51 |
| 520 | SEA WATER SYSTEMS | 39.9 | 19.58 |
| 521 | FIREMAIN+SEA WATER FLUSHING SYS | 20.5 | 18.75 |
| 522 | SPRINKLING SYSTEM | | 21.67 |
| 523 | WASHDOWN SYSTEM | 3.0 | 34.23 |
| 524 | AUXILIARY SEAWATER SYSTEM | | |
| 526 | SCUPPERS+DECK DRAINS | .8 | 31.63 |
| 527 | FIREMAIN ACTUATED SERV, OTHER | | |
| 528 | PLUMBING DRAINAGE | 12.0 | 19.50 |
| 529 | DRAINAGE+BALLASTING SYSTEM | 3.6 | 9.90 |
| 530 | FRESH WATER SYSTEMS | 23.6 | 17.07 |
| 531 | DISTILLING PLANT | 3.8 | 15.91 |
| * 532 | COOLING WATER | 4.0 | 25.73 |
| 533 | POTABLE WATER | 5.9 | 19.56 |
| 534 | AUX STEAM + DRAINS IN MACH BOX | 9.8 | 12.49 |
| 535 | AUX STEAM + DRAINS OUT MACH BOX | | |
| 536 | AUXILIARY FRESH WATER COOLING | | |
| 540 | FUELS/LUBRICANTS,HANDLING+STORAGE | 31.1 | 12.53 |
| 541 | SHIP FUEL+COMPENSATING SYSTEM | 29.8 | 12.91 |
| 542 | AVIATION+GENERAL PURPOSE FUELS | | |
| 543 | AVIATION+GENERAL PURPOSE LUBO | | |
| 544 | LIQUID CARGO | | |
| 545 | TANK HEATING | 1.3 | 3.90 |
| 549 | SPEC FUEL+LUBRICANTS HANDL+STOW | | |
| 550 | AIR,GAS+MISC FLUID SYSTEM | 43.0 | 18.56 |
| 551 | COMPRESSED AIR SYSTEMS | 19.8 | 16.51 |
| 552 | COMPRESSED GASES | | |
| 553 | O2 N2 SYSTEM | | |
| 554 | LP BLOW | | |
| 555 | FIRE EXTINGUISHING SYSTEMS | 23.2 | 20.32 |
| 556 | HYDRAULIC FLUID SYSTEM | | |
| 557 | LIQUID GASES, CARGO | | |
| 558 | SPECIAL PIPING SYSTEMS | | |
| 560 | SHIP CNTL SYS | 76.8 | 5.66 |
| 561 | STEERING+DIVING CNTL SYS | 11.8 | 17.45 |
| 562 | RUDDER | 27.6 | 7.04 |
| 565 | TRIM+HEEL SYSTEMS | 37.4 | .90 |
| 568 | MANEUVERING SYSTEMS | | |
| 570 | UNDERWAY REPLENISHMENT SYSTEMS | 45.8 | 26.90 |
| 571 | REPLENISHMENT-AT-SEA SYSTEMS | 10.7 | 36.82 |
| 572 | SHIP STORES+EQUIP HANDLING SYS | 35.1 | 23.88 |
| 573 | CARGO HANDLING SYSTEMS | | |
| 574 | VERTICAL REPLENISHMENT SYSTEMS | | |
| 580 | MECHANICAL HANDLING SYSTEMS | 74.5 | 30.98 |

| | | | | |
|---|---|---|---|---|
| | 581 | ANCHOR HANDLING+STOWAGE SYSTEMS | 23.9 | 18.78 |
| | 582 | MOORING+TOWING SYSTEMS | 10.1 | 30.76 |
| | 583 | BOATS,HANDLING+STOWAGE SYSTEMS | 35.6 | 39.00 |
| | 584 | MECH OPER DOOR,GATE,RAMP,TTBL SYS | | |
| | 585 | ELEVATING + RETRACTING GEAR | | |
| | 586 | AIRCRAFT RECOVERY SUPPORT SYS | | |
| | 587 | AIRCRAFT LAUNCH SUPPORT SYSTEM | | |
| * | 588 | AIRCRAFT HANDLING,SERVICING,STOWAGE | 5.0 | 32.76 |
| | 589 | MISC MECH HANDLING SYSTEMS | | |
| | 590 | SPECIAL PURPOSE SYSTEMS | 47.9 | 17.30 |
| | 591 | SCIENTIFIC+OCEAN ENGINEERING SYS | | |
| | 592 | SWIMMER+DIVER SUPPORT+PROT SYS | | |
| | 593 | ENVIRONMENTAL POLLUTION CNTL SYS | 9.7 | 11.44 |
| | 594 | SUBMARINE RESC+SALVG+SURVIVE SYS | | |
| | 595 | TOW,LAUNCH,HANDLE UNDERWATER SYS | | |
| | 596 | HANDLING SYS FOR DIVER+SUBMR VEH | | |
| | 597 | SALVAGE SUPPORT SYSTEMS | | |
| | 598 | AUX SYSTEMS OPERATING FLUIDS | 32.8 | 19.26 |
| | 599 | AUX SYSTEMS REPAIR PARTS+TOOLS | 5.5 | 15.90 |

* DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS

OUTFIT+FURNISHINGS WEIGHT

| SWBS | COMPONENT | WT-LTON | VCG-FT |
|---|---|---|---|
| 671 | LOCKERS+SPECIAL STOWAGE | 4.0 | 22.29 |
| 672 | STOREROOMS+ISSUE ROOMS | 25.3 | 14.15 |

* DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS

```
C,E>RUN,WEIGH
COMMAND STRING IS:
 RUN,WEIGHT MODULE
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ASSET/MONOSC VERSION 3.3+ - WEIGHT MODULE - 2/11/95 11.18.28.

PRINTED REPORT NO. 1 - SUMMARY

| SWBS | GROUP | WEIGHT LTON | WEIGHT PER CENT | LCG FT | VCG FT | RESULTANT ADJ WT-LTON | RESULTANT ADJ VCG-FT |
|---|---|---|---|---|---|---|---|
| 100 | HULL STRUCTURE | 1289.7 | 33.8 | 186.46 | 21.40 | 1.0 | .00 |
| 200 | PROP PLANT | 272.3 | 7.1 | 247.04 | 13.40 | | |
| 300 | ELECT PLANT | 248.0 | 6.5 | 199.42 | 16.82 | | |
| 400 | COMM + SURVEIL | 129.8 | 3.4 | 144.40 | 25.23 | 83.4 | .53 |
| 500 | AUX SYSTEMS | 516.9 | 13.6 | 209.00 | 20.39 | 20.0 | .19 |
| 600 | OUTFIT + FURN | 307.2 | 8.1 | 190.00 | 20.62 | | |
| 700 | ARMAMENT | 20.6 | 0.5 | 171.00 | 33.68 | 16.2 | .15 |
| M11 | D+B WT MARGIN | 347.9 | 9.1 | 196.04 | 20.21 | | |
| | D+B KG MARGIN | | | + | 2.53 | | |
| | LIGHTSHIP | 3132.4 | 82.1 | 196.04 | 22.73 | 120.6 | .88 |
| F00 | FULL LOADS | 680.8 | 17.9 | 194.16 | 4.72 | 85.0 | .22 |
| F10 | CREW + EFFECTS | 13.0 | | 178.60 | 22.98 | | |
| F20 | MISS REL EXPEN | 21.2 | | 167.20 | 10.40 | | |
| F30 | SHIPS STORES | 17.4 | | 205.20 | 17.23 | | |
| F40 | FUELS + LUBRIC | 611.1 | | 195.44 | 3.79 | | |
| F50 | FRESH WATER | 18.1 | | | 4.33 | | |
| F60 | CARGO | | | | | | |
| M24 | FUTURE GROWTH | | | | | | |
| | FULL LOAD WT | 3813.2 | 100.0 | 195.70 | 19.52 | 205.6 | 1.10 |

PRINTED REPORT NO. 2 - HULL STRUCTURES WEIGHT

| SWBS | COMPONENT | WT-LTON | VCG-FT |
|---|---|---|---|
| 100 | HULL STRUCTURES | 1289.7 | 21.40 |
| 110 | SHELL + SUPPORTS | 379.2 | 13.48 |
| 111 | PLATING | 218.4 | 18.76 |
| 113 | INNER BOTTOM | 36.4 | 4.50 |
| 114 | SHELL APPENDAGES | 17.1 | 3.67 |
| 115 | STANCHIONS | 5.1 | 15.00 |
| 116 | LONGIT FRAMING | 64.2 | 1.49 |
| 117 | TRANSV FRAMING | 38.0 | 16.26 |
| 120 | HULL STRUCTURAL BULKHDS | 78.0 | 18.79 |
| 121 | LONGIT STRUCTURAL BULKHDS | | |
| 122 | TRANSV STRUCTURAL BULKHDS | 66.6 | 18.79 |
| 123 | TRUNKS + ENCLOSURES | 11.3 | 18.79 |
| 124 | BULKHEADS, TORPEDO PROTECT SYS | | |
| 130 | HULL DECKS | 260.9 | 26.76 |
| 131 | MAIN DECK | 153.3 | 31.05 |
| 132 | 2ND DECK | 107.6 | 20.66 |
| 133 | 3RD DECK | | |
| 134 | 4TH DECK | | |
| 135 | 5TH DECK+DECKS BELOW | | |
| 136 | 01 HULL DECK | | |
| 137 | 02 HULL DECK | | |
| 138 | 03 HULL DECK | | |
| 139 | 04 HULL DECK | | |
| 140 | HULL PLATFORMS/FLATS | 58.5 | 12.22 |
| 141 | 1ST PLATFORM | 58.5 | 12.22 |
| 142 | 2ND PLATFORM | | |
| 143 | 3RD PLATFORM | | |
| 144 | 4TH PLATFORM | | |
| 145 | 5TH PLAT+PLATS BELOW | | |
| 149 | FLATS | | |
| 150 | DECK HOUSE STRUCTURE | 201.0 | 36.41 |
| 160 | SPECIAL STRUCTURES | 59.3 | 16.12 |
| 161 | CASTINGS+FORGINGS+EQUIV WELDMT | 31.4 | 9.30 |
| 162 | STACKS AND MACKS | 2.1 | 46.37 |
| 163 | SEA CHESTS | 3.1 | 3.70 |
| 164 | BALLISTIC PLATING | | |
| 165 | SONAR DOMES | | |
| 166 | SPONSONS | | |
| 167 | HULL STRUCTURAL CLOSURES | 17.9 | 21.97 |
| 168 | DKHS STRUCTURAL CLOSURES | .8 | 38.03 |
| 169 | SPECIAL PURPOSE CLOSURES+STRUCT | 4.1 | 33.05 |
| 170 | MASTS+KINGPOSTS+SERV PLATFORM | 31.6 | 79.40 |
| 171 | MASTS,TOWERS,TETRAPODS | 31.6 | 79.40 |
| 172 | KINGPOSTS AND SUPPORT FRAMES | | |
| 179 | SERVICE PLATFORMS | | |
| 180 | FOUNDATIONS | 207.5 | 11.98 |
| 181 | HULL STRUCTURE FOUNDATIONS | | |
| 182 | PROPULSION PLANT FOUNDATIONS | 90.3 | 7.47 |
| 183 | ELECTRIC PLANT FOUNDATIONS | 43.8 | 12.82 |
| 184 | COMMAND+SURVEILLANCE FDNS | 10.7 | 23.46 |
| 185 | AUXILIARY SYSTEMS FOUNDATIONS | 51.7 | 15.22 |
| 186 | OUTFIT+FURNISHINGS FOUNDATIONS | 9.5 | 17.97 |
| 187 | ARMAMENT FOUNDATIONS | 1.5 | 27.32 |
| 190 | SPECIAL PURPOSE SYSTEMS | 13.8 | 3.78 |
| * 191 | BALLAST+BOUYANCY UNITS | 1.0 | 1.00 |
| 197 | WELDING AND RIVETS | | |
| 198 | FREE FLOODING LIQUIDS | 12.8 | 4.00 |

* DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS

PRINTED REPORT NO. 3 - PROPULSION PLANT WEIGHT

| SWBS | COMPONENT | WT-LTON | VCG-FT |
|---|---|---|---|
| 200 | PROPULSION PLANT | 272.3 | 13.40 |
| 210 | ENERGY GEN SYS (NUCLEAR) | | |
| 220 | ENERGY GENERATING SYSTEM (NONNUC) | | |
| 221 | PROPULSION BOILERS | | |
| 222 | GAS GENERATORS | | |
| 223 | MAIN PROPULSION BATTERIES | | |
| 224 | MAIN PROPULSION FUEL CELLS | | |
| 230 | PROPULSION UNITS | 181.3 | 12.17 |
| 231 | STEAM TURBINES | | |
| 232 | STEAM ENGINES | | |
| 233 | DIESEL ENGINES | | |
| 234 | GAS TURBINES | 58.2 | 17.33 |
| 235 | ELECTRIC PROPULSION | 123.1 | 9.73 |
| 236 | SELF-CONTAINED PROPULSION SYS | | |
| 237 | AUXILIARY PROPULSION DEVICES | | |
| 240 | TRANSMISSION+PROPULSOR SYSTEMS | 20.6 | 2.52 |
| 241 | REDUCTION GEARS | | |
| 242 | CLUTCHES + COUPLINGS | | |
| 243 | SHAFTING | 1.4 | 2.62 |
| 244 | SHAFT BEARINGS | 5.9 | 2.88 |
| 245 | PROPULSORS | 13.3 | 2.35 |
| 246 | PROPULSOR SHROUDS AND DUCTS | | |
| 247 | WATER JET PROPULSORS | | |
| 250 | SUPPORT SYSTEMS | 35.0 | 28.20 |
| 251 | COMBUSTION AIR SYSTEM | 10.0 | 27.25 |
| 252 | PROPULSION CONTROL SYSTEM | 8.9 | 19.50 |
| 253 | MAIN STEAM PIPING SYSTEM | | |
| 254 | CONDENSERS AND AIR EJECTORS | | |
| 255 | FEED AND CONDENSATE SYSTEM | | |
| 256 | CIRC + COOL SEA WATER SYSTEM | 2.4 | 10.80 |
| 258 | H.P. STEAM DRAIN SYSTEM | | |
| 259 | UPTAKES (INNER CASING) | 13.6 | 37.76 |
| 260 | PROPUL SUP SYS- FUEL, LUBE OIL | 23.4 | 12.42 |
| 261 | FUEL SERVICE SYSTEM | 9.4 | 11.33 |
| 262 | MAIN PROPULSION LUBE OIL SYSTEM | 10.0 | 12.00 |
| 264 | LUBE OIL HANDLING | 4.0 | 16.00 |
| 290 | SPECIAL PURPOSE SYSTEMS | 12.0 | 9.53 |
| 298 | OPERATING FLUIDS | 9.0 | 8.00 |
| 299 | REPAIR PARTS + TOOLS | 3.0 | 14.10 |

* DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS

PRINTED REPORT NO. 4 - ELECTRIC PLANT WEIGHT

| SWBS | COMPONENT | WT-LTON | VCG-FT |
|---|---|---|---|
| 300 | ELECTRIC PLANT, GENERAL | 248.0 | 16.82 |
| 310 | ELECTRIC POWER GENERATION | 121.9 | 12.01 |
| 311 | SHIP SERVICE POWER GENERATION | 89.8 | 12.00 |
| 312 | EMERGENCY GENERATORS | | |
| 313 | BATTERIES+SERVICE FACILITIES | 22.8 | 6.00 |
| 314 | POWER CONVERSION EQUIPMENT | 9.2 | 27.00 |
| 320 | POWER DISTRIBUTION SYS | 51.7 | 24.76 |
| 321 | SHIP SERVICE POWER CABLE | 32.4 | 27.00 |
| 322 | EMERGENCY POWER CABLE SYS | | |
| 323 | CASUALTY POWER CABLE SYS | | |
| 324 | SWITCHGEAR+PANELS | 19.3 | 21.00 |
| 330 | LIGHTING SYSTEM | 18.7 | 27.22 |
| 331 | LIGHTING DISTRIBUTION | 11.8 | 27.00 |
| 332 | LIGHTING FIXTURES | 6.9 | 27.60 |
| 340 | POWER GENERATION SUPPORT SYS | 37.7 | 17.56 |

| | | | |
|---|---|---|---|
| | 341 SSTG LUBE OIL | | |
| | 342 DIESEL SUPPORT SYS | 37.7 | 17.56 |
| | 343 TURBINE SUPPORT SYS | | |
| | 390 SPECIAL PURPOSE SYS | 18.0 | 14.25 |
| | 398 ELECTRIC PLANT OP FLUIDS | 13.5 | 12.00 |
| | 399 REPAIR PARTS+SPECIAL TOOLS | 4.5 | 21.00 |

* DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS

PRINTED REPORT NO. 5 - COMMAND+SURVEILLANCE WEIGHT

| | SWBS | COMPONENT | WT-LTON | VCG-FT |
|---|---|---|---|---|
| | 400 | COMMAND+SURVEILLANCE | 129.8 | 25.23 |
| * | 410 | COMMAND+CONTROL SYS | 37.0 | 1.47 |
| | 411 | DATA DISPLAY GROUP | | |
| | 412 | DATA PROCESSING GROUP | | |
| | 413 | DIGITAL DATA SWITCHBOARDS | | |
| | 414 | INTERFACE EQUIPMENT | | |
| | 415 | DIGITAL DATA COMMUNICATIONS | | |
| | 417 | COMMAND+CONTROL ANALOG SWBD | | |
| * | 420 | NAVIGATION SYS | 3.8 | 44.83 |
| | 430 | INTERIOR COMMUNICATIONS | 18.5 | 25.42 |
| * | 440 | EXTERIOR COMMUNICATIONS | 16.0 | 21.80 |
| | 441 | RADIO SYSTEMS | | |
| | 442 | UNDERWATER SYSTEMS | | |
| | 443 | VISUAL + AUDIBLE SYSTEMS | | |
| | 444 | TELEMETRY SYSTEMS | | |
| | 445 | TTY + FACSIMILE SYSTEMS | | |
| | 446 | SECURITY EQUIPMENT SYSTEMS | | |
| | 450 | SURF SURV SYS (RADAR) | 22.0 | 61.59 |
| * | 451 | SURFACE SEARCH RADAR | 1.8 | 59.50 |
| | 452 | AIR SEARCH RADAR (2D) | | |
| | 453 | AIR SEARCH RADAR (3D) | | |
| | 454 | AIRCRAFT CONTROL APPROACH RADAR | | |
| * | 455 | IDENTIFICATION SYSTEMS (IFF) | 2.3 | 60.00 |
| * | 456 | MULTIPLE MODE RADAR | 18.0 | 62.00 |
| | 459 | SPACE VEHICLE ELECTRONIC TRACKG | | |
| | 460 | UNDERWATER SURVEILLANCE SYSTEMS | | |
| | 461 | ACTIVE SONAR | | |
| | 462 | PASSIVE SONAR | | |
| | 463 | MULTIPLE MODE SONAR | | |
| | 464 | CLASSIFICATION SONAR | | |
| | 465 | BATHYTHERMOGRAPH | | |
| | 466 | LAMPS ELECTRONICS | | |
| | 470 | COUNTERMEASURES | 22.3 | 25.57 |
| | 471 | ACTIVE + ACTIVE/PASSIVE ECM | | |
| * | 472 | PASSIVE ECM | 3.0 | 51.00 |
| * | 473 | TORPEDO DECOYS | 3.6 | 22.76 |
| | 474 | DECOYS (OTHER) | | |
| | 475 | DEGAUSSING | 15.7 | 21.34 |
| | 476 | MINE COUNTERMEASURES | | |
| | 480 | FIRE CONTROL SYS | | |
| | 481 | GUN FIRE CONTROL SYSTEMS | | |
| | 482 | MISSILE FIRE CONTROL SYSTEMS | | |
| | 483 | UNDERWATER FIRE CONTROL SYSTEMS | | |
| | 484 | INTEGRATED FIRE CONTROL SYSTEMS | | |
| | 489 | WEAPON SYSTEM SWITCHBOARDS | | |
| | 490 | SPECIAL PURPOSE SYS | 10.3 | 29.70 |
| * | 491 | ELCTRNC TEST,CHKOUT,MONITR EQPT | 6.0 | 33.61 |
| | 492 | FLIGHT CNTRL+INSTR LANDING SYS | | |
| | 493 | NON-COMBAT DATA PROCESSING SYS | 2.3 | 21.67 |
| | 494 | METEOROLOGICAL SYSTEMS | | |
| | 495 | SPEC PURPOSE INTELLIGENCE SYS | | |
| | 498 | C+S OPERATING FLUIDS | | |
| | 499 | REPAIR PARTS+SPECIAL TOOLS | 1.9 | 26.9 |

* DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS

PRINTED REPORT NO. 6 - AUXILIARY SYSTEMS WEIGHT

| SWBS | COMPONENT | WT-LTON | VCG-FT |
|---|---|---|---|
| *500 | AUXILIARY SYSTEMS, GENERAL | 516.9 | 20.39 |
| 510 | CLIMATE CONTROL | 114.3 | 23.01 |
| 511 | COMPARTMENT HEATING SYSTEM | 4.4 | 25.65 |
| 512 | VENTILATION SYSTEM | 43.4 | 28.77 |
| 513 | MACHINERY SPACE VENT SYSTEM | 8.7 | 32.71 |
| 514 | AIR CONDITIONING SYSTEM | 55.7 | 17.12 |
| 516 | REFRIGERATION SYSTEM | 1.9 | 14.86 |
| 517 | AUX BOILERS+OTHER HEAT SOURCES | .3 | 17.51 |
| 520 | SEA WATER SYSTEMS | 39.9 | 19.58 |
| 521 | FIREMAIN+SEA WATER FLUSHING SYS | 20.5 | 18.75 |
| 522 | SPRINKLING SYSTEM | | 21.67 |
| 523 | WASHDOWN SYSTEM | 3.0 | 34.23 |
| 524 | AUXILIARY SEAWATER SYSTEM | | |
| 526 | SCUPPERS+DECK DRAINS | .8 | 31.63 |
| 527 | FIREMAIN ACTUATED SERV, OTHER | | |
| 528 | PLUMBING DRAINAGE | 12.0 | 19.50 |
| 529 | DRAINAGE+BALLASTING SYSTEM | 3.6 | 9.90 |
| 530 | FRESH WATER SYSTEMS | 23.6 | 17.07 |
| 531 | DISTILLING PLANT | 3.8 | 15.91 |
| * 532 | COOLING WATER | 4.0 | 25.73 |
| 533 | POTABLE WATER | 5.9 | 19.56 |
| 534 | AUX STEAM + DRAINS IN MACH BOX | 9.8 | 12.49 |
| 535 | AUX STEAM + DRAINS OUT MACH BOX | | |
| 536 | AUXILIARY FRESH WATER COOLING | | |
| 540 | FUELS/LUBRICANTS,HANDLING+STORAGE | 31.1 | 12.53 |
| 541 | SHIP FUEL+COMPENSATING SYSTEM | 29.8 | 12.91 |
| 542 | AVIATION+GENERAL PURPOSE FUELS | | |
| 543 | AVIATION+GENERAL PURPOSE LUBO | | |
| 544 | LIQUID CARGO | | |
| 545 | TANK HEATING | 1.3 | 3.90 |
| 549 | SPEC FUEL+LUBRICANTS HANDL+STOW | | |
| 550 | AIR,GAS+MISC FLUID SYSTEM | 43.0 | 18.56 |
| 551 | COMPRESSED AIR SYSTEMS | 19.8 | 16.51 |
| 552 | COMPRESSED GASES | | |
| 553 | O2 N2 SYSTEM | | |
| 554 | LP BLOW | | |
| 555 | FIRE EXTINGUISHING SYSTEMS | 23.2 | 20.32 |
| 556 | HYDRAULIC FLUID SYSTEM | | |
| 557 | LIQUID GASES, CARGO | | |
| 558 | SPECIAL PIPING SYSTEMS | | |
| 560 | SHIP CNTL SYS | 76.8 | 5.66 |
| 561 | STEERING+DIVING CNTL SYS | 11.8 | 17.45 |
| 562 | RUDDER | 27.6 | 7.04 |
| 565 | TRIM+HEEL SYSTEMS | 37.4 | .90 |
| 568 | MANEUVERING SYSTEMS | | |
| 570 | UNDERWAY REPLENISHMENT SYSTEMS | 45.8 | 26.90 |
| 571 | REPLENISHMENT-AT-SEA SYSTEMS | 10.7 | 36.82 |
| 572 | SHIP STORES+EQUIP HANDLING SYS | 35.1 | 23.88 |
| 573 | CARGO HANDLING SYSTEMS | | |
| 574 | VERTICAL REPLENISHMENT SYSTEMS | | |
| 580 | MECHANICAL HANDLING SYSTEMS | 74.5 | 30.98 |
| 581 | ANCHOR HANDLING+STOWAGE SYSTEMS | 23.9 | 18.78 |
| 582 | MOORING+TOWING SYSTEMS | 10.1 | 30.76 |
| 583 | BOATS,HANDLING+STOWAGE SYSTEMS | 35.6 | 39.00 |
| 584 | MECH OPER DOOR,GATE,RAMP,TTBL SYS | | |
| 585 | ELEVATING + RETRACTING GEAR | | |
| 586 | AIRCRAFT RECOVERY SUPPORT SYS | | |
| 587 | AIRCRAFT LAUNCH SUPPORT SYSTEM | | |
| * 588 | AIRCRAFT HANDLING,SERVICING,STOWAGE | 5.0 | 32.76 |
| 589 | MISC MECH HANDLING SYSTEMS | | |

| | | | |
|---|---|---|---|
| 590 | SPECIAL PURPOSE SYSTEMS | 47.9 | 17.30 |
| 591 | SCIENTIFIC+OCEAN ENGINEERING SYS | | |
| 592 | SWIMMER+DIVER SUPPORT+PROT SYS | | |
| 593 | ENVIRONMENTAL POLLUTION CNTL SYS | 9.7 | 11.44 |
| 594 | SUBMARINE RESC+SALVG+SURVIVE SYS | | |
| 595 | TOW,LAUNCH,HANDLE UNDERWATER SYS | | |
| 596 | HANDLING SYS FOR DIVER+SUBMR VEH | | |
| 597 | SALVAGE SUPPORT SYSTEMS | | |
| 598 | AUX SYSTEMS OPERATING FLUIDS | 32.8 | 19.26 |
| 599 | AUX SYSTEMS REPAIR PARTS+TOOLS | 5.5 | 15.90 |

* DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS

PRINTED REPORT NO. 7 - OUTFIT+FURNISHINGS WEIGHT

| SWBS | COMPONENT | WT-LTON | VCG-FT |
|---|---|---|---|
| 600 | OUTFIT+FURNISHING,GENERAL | 307.2 | 20.62 |
| 610 | SHIP FITTINGS | 8.8 | 35.41 |
| 611 | HULL FITTINGS | 1.8 | 27.95 |
| 612 | RAILS,STANCHIONS+LIFELINES | 6.2 | 36.41 |
| 613 | RIGGING+CANVAS | .8 | 43.70 |
| 620 | HULL COMPARTMENTATION | 71.3 | 19.04 |
| 621 | NON-STRUCTURAL BULKHEADS | 19.1 | 27.15 |
| 622 | FLOOR PLATES+GRATING | 38.1 | 12.73 |
| 623 | LADDERS | 9.2 | 22.10 |
| 624 | NON-STRUCTURAL CLOSURES | 3.9 | 26.99 |
| 625 | AIRPORTS,FIXED PORTLIGHTS,WINDOWS | 1.0 | 44.00 |
| 630 | PRESERVATIVES+COVERINGS | 126.6 | 20.70 |
| 631 | PAINTING | 30.7 | 17.12 |
| 632 | ZINC COATING | | |
| 633 | CATHODIC PROTECTION | 2.1 | 7.00 |
| 634 | DECK COVERINGS | 26.6 | 23.51 |
| 635 | HULL INSULATION | 41.0 | 26.43 |
| 636 | HULL DAMPING | 13.2 | 4.03 |
| 637 | SHEATHING | 8.1 | 28.60 |
| 638 | REFRIGERATION SPACES | 4.9 | 17.55 |
| 639 | RADIATION SHIELDING | | |
| 640 | LIVING SPACES | 24.7 | 21.63 |
| 641 | OFFICER BERTHING+MESSING | 6.8 | 30.33 |
| 642 | NON-COMM OFFICER B+M | 3.0 | 22.97 |
| 643 | ENLISTED PERSONNEL B+M | 12.1 | 16.47 |
| 644 | SANITARY SPACES+FIXTURES | 1.5 | 22.10 |
| 645 | LEISURE+COMMUNITY SPACES | 1.2 | 19.93 |
| 650 | SERVICE SPACES | 9.9 | 21.99 |
| 651 | COMMISSARY SPACES | 4.9 | 22.10 |
| 652 | MEDICAL SPACES | 1.3 | 24.92 |
| 653 | DENTAL SPACES | | |
| 654 | UTILITY SPACES | 1.2 | 25.13 |
| 655 | LAUNDRY SPACES | 2.2 | 18.20 |
| 656 | TRASH DISPOSAL SPACES | .4 | 22.97 |
| 660 | WORKING SPACES | 33.3 | 23.51 |
| 661 | OFFICES | 10.2 | 23.62 |
| 662 | MACH CNTL CENTER FURNISHING | .7 | 13.76 |
| 663 | ELECT CNTL CENTER FURNISHING | 5.1 | 29.25 |
| 664 | DAMAGE CNTL STATIONS | 7.9 | 24.05 |
| 665 | WORKSHOPS,LABS,TEST AREAS | 9.4 | 20.58 |
| 670 | STOWAGE SPACES | 29.3 | 15.25 |
| 671 | LOCKERS+SPECIAL STOWAGE | 4.0 | 22.29 |
| 672 | STOREROOMS+ISSUE ROOMS | 25.3 | 14.15 |
| 673 | CARGO STOWAGE | | |
| 690 | SPECIAL PURPOSE SYSTEMS | 3.2 | 18.81 |
| 698 | OPERATING FLUIDS | .2 | 20.12 |
| 699 | REPAIR PARTS+SPECIAL TOOLS | 3.0 | 18.74 |

* DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS

PRINTED REPORT NO. 8 - ARMAMENT WEIGHT

| SWBS | COMPONENT | WT-LTON | VCG-FT |
|---|---|---|---|
| 700 | ARMAMENT | 20.6 | 33.68 |
| * 710 | GUNS+AMMUNITION | 12.2 | 33.52 |
| 711 | GUNS | | |
| 712 | AMMUNITION HANDLING | | |
| 713 | AMMUNITION STOWAGE | | |
| * 720 | MISSLES+ROCKETS | 4.0 | 44.00 |
| 721 | LAUNCHING DEVICES | | |
| 722 | MISSILE,ROCKET,GUID CAP HANDL SYS | | |
| 723 | MISSILE+ROCKET STOWAGE | | |
| 724 | MISSILE HYDRAULICS | | |
| 725 | MISSILE GAS | | |
| 726 | MISSILE COMPENSATING | | |
| 727 | MISSILE LAUNCHER CONTROL | | |
| 728 | MISSILE HEAT,COOL,TEMP CNTRL | | |
| 729 | MISSILE MONITOR,TEST,ALINEMENT | | |
| 730 | MINES | | |
| 731 | MINE LAUNCHING DEVICES | | |
| 732 | MINE HANDLING | | |
| 733 | MINE STOWAGE | | |
| 740 | DEPTH CHARGES | | |
| 741 | DEPTH CHARGE LAUNCHING DEVICES | | |
| 742 | DEPTH CHARGE HANDLING | | |
| 743 | DEPTH CHARGE STOWAGE | | |
| 750 | TORPEDOES | | |
| 751 | TORPEDO TUBES | | |
| 752 | TORPEDO HANDLING | | |
| 753 | TORPEDO STOWAGE | | |
| 760 | SMALL ARMS+PYROTECHNICS | 1.7 | 27.30 |
| 761 | SMALL ARMS+PYRO LAUNCHING DEV | 1.0 | 27.30 |
| 762 | SMALL ARMS+PYRO HANDLING | | |
| 763 | SMALL ARMS+PYRO STOWAGE | .7 | 27.30 |
| 770 | CARGO MUNITIONS | | |
| 772 | CARGO MUNITIONS HANDLING | | |
| 773 | CARGO MUNITIONS STOWAGE | | |
| 780 | AIRCRAFT RELATED WEAPONS | | |
| 782 | AIRCRAFT RELATED WEAPONS HANDL | | |
| 783 | AIRCRAFT RELATED WEAPONS STOW | | |
| 790 | SPECIAL PURPOSE SYSTEMS | 2.7 | 23.02 |
| 791 | SPECIAL WEAPONS | | |
| 792 | SPECIAL WEAPONS HANDLING | | |
| 793 | SPECIAL WEAPONS STOWAGE | | |
| 797 | MISC ORDINANCE SPACES | | |
| 798 | ARMAMENT OPERATING FLUIDS | .2 | 36.66 |
| 799 | ARMAMENT REPAIR PART+TOOLS | 2.4 | 21.86 |

* DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS

PRINTED REPORT NO. 9 - LOADS WEIGHT (FULL LOAD CONDITION)

| SWBS | COMPONENT | WT-LTON | VCG-FT |
|---|---|---|---|
| F00 | LOADS | 680.8 | 4.72 |
| F10 | SHIPS FORCE | 13.0 | 22.98 |
| F11 | OFFICERS | 2.7 | 22.98 |
| F12 | NON-COMMISSIONED OFFICERS | 1.9 | 22.98 |
| F13 | ENLISTED MEN | 8.4 | 22.98 |
| F14 | MARINES | | |
| F15 | TROOPS | | |
| F16 | AIR WING PERSONNEL | | |
| F19 | OTHER PERSONNEL | | |

| | | | | |
|---|---|---|---|---|
| | F20 | MISSION RELATED EXPENDABLES+SYS | 21.2 | 10.40 |
| * | F21 | SHIP AMMUNITION | 14.8 | 8.85 |
| | F22 | ORD DEL SYS AMMO | | |
| * | F23 | ORD DEL SYS (AIRCRAFT) | 4.4 | 5.00 |
| | F24 | ORD REPAIR PARTS (SHIP) | | |
| | F25 | ORD REPAIR PARTS (ORD) | | |
| * | F26 | ORD DEL SYS SUPPORT EQUIP | 2.0 | 33.76 |
| | F29 | SPECIAL MISSION RELATED SYS | | |
| | F30 | STORES | 17.4 | 17.23 |
| | F31 | PROVISIONS+PERSONNEL STORES | 14.2 | 16.82 |
| | F32 | GENERAL STORES | 3.2 | 19.05 |
| | F33 | MARINES STORES (SHIPS COMPLEM) | | |
| | F39 | SPECIAL STORES | | |
| | F40 | LIQUIDS, PETROLEUM BASED | 611.1 | 3.79 |
| | F41 | DIESEL FUEL MARINE | 544.3 | 3.10 |
| * | F42 | JP-5 | 63.8 | 9.84 |
| | F43 | GASOLINE | | |
| | F44 | DISTILLATE FUEL | | |
| | F45 | NAVY STANDARD FUEL OIL (NSFO) | | |
| | F46 | LUBRICATING OIL | 3.0 | |
| | F49 | SPECIAL FUELS AND LUBRICANTS | | |
| | F50 | LIQUIDS, NON-PETRO BASED | 18.1 | 4.33 |
| | F51 | SEA WATER | | |
| | F52 | FRESH WATER | 18.1 | 4.33 |
| | F53 | RESERVE FEED WATER | | |
| | F54 | HYDRAULIC FLUID | | |
| | F55 | SANITARY TANK LIQUID | | |
| | F56 | GAS (NON FUEL TYPE) | | |
| | F59 | MISC LIQUIDS, NON-PETROLEUM | | |
| | F60 | CARGO | | |
| | F61 | CARGO, ORDINANCE + DELIVERY SYS | | |
| | F62 | CARGO, STORES | | |
| | F63 | CARGO, FUELS + LUBRICANTS | | |
| | F64 | CARGO, LIQUIDS, NON-PETROLEUM | | |
| | F65 | CARGO, CRYOGENIC+LIQUEFIED GAS | | |
| | F66 | CARGO, AMPHIBIOUS ASSAULT SYS | | |
| | F67 | CARGO, GASES | | |
| | F69 | CARGO, MISCELLANEOUS | | |
| | M24 | FUTURE GROWTH MARGIN | | |

* DENOTES INCLUSION OF PAYLOAD OR ADJUSTMENTS

PRINTED REPORT NO. 10 - WEIGHT AND KG MODIFICATION SUMMARY

| ROW | P+A NAME / WT KEYS | ORIGINAL WT, LTON | WT CHNG, LTON | RESULTNT WT, LTON | ORIGINAL KG, FT | KG CHNG, FT | RESULTNT KG, FT |
|---|---|---|---|---|---|---|---|
| 15 | BALLIST | | | | | | |
| | W191 | 0.0 | 1.0 | 1.0 | UNKNOWN | 1.0 | 1.0 |
| 1 | CIC COMMAND AND DECISION MODFIG | | | | | | |
| | W410 | 0.0 | 7.0 | | UNKNOWN | -7.2 | |
| 11 | CS HOLD UP BATTERY | | | | | | |
| | | | 30.0 | 37.0 | | 3.5 | 1.5 |
| 3 | NAV SYS (1/2 DDG 51) | | | | | | |
| | W420 | UNKNOWN | UNKNOWN | 3.8 | UNKNOWN | 46.0 | 44.8 |
| 2 | EXCOMM (1/2 DDG51) | | | | | | |
| | W440 | 0.0 | 16.0 | 16.0 | UNKNOWN | 21.8 | 21.8 |
| 4 | SPS-67 SSR | | | | | | |
| | W451 | 0.0 | 1.8 | 1.8 | UNKNOWN | 59.5 | 59.5 |
| 6 | MK XII AIMS IFF | | | | | | |
| | W455 | 0.0 | 2.3 | 2.3 | UNKNOWN | 60.0 | 60.0 |
| 5 | SPY-3C (MINI-SPY) | | | | | | |
| | W456 | 0.0 | 18.0 | 18.0 | UNKNOWN | 62.0 | 62.0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 9 | SLQ-32(V)3 ACTIVE/PASSIVE ECM | | | | | | |
| | W472 | 0.0 | 3.0 | 3.0 | UNKNOWN | 51.0 | 51.0 |
| 8 | SLQ-25 NIXIE | | | | | | |
| | W473 | 0.0 | 3.6 | 3.6 | UNKNOWN | 22.8 | 22.8 |
| 16 | OPER READINESS AND TEST SYS | | | | | | |
| | W491 | 2.3 | 3.0 | | -12.0 | 32.5 | |
| 32 | ADMIN LAN | | | | | | |
| | | | 0.7 | 6.0 | | 30.0 | 33.6 |
| 14 | CRANE | | | | | | |
| | W500 | 496.9 | 20.0 | 516.9 | 19.7 | 36.7 | 20.4 |
| 12 | SENSOR COOLING SYSTEMS | | | | | | |
| | W532 | UNKNOWN | UNKNOWN | 4.0 | UNKNOWN | 10.0 | 25.7 |
| 17 | RAST/TALON HELO COMBO | | | | | | |
| | W588 | 0.0 | 5.0 | | UNKNOWN | 32.8 | |
| 18 | RAST CONTROL STATION | | | | | | |
| | | | 0.0 | 5.0 | | 0.0 | 32.8 |
| 21 | 1X 40MM CIWS/MULTI PURP GUN | | | | | | |
| | W710 | 0.0 | 6.1 | | UNKNOWN | 34.7 | |
| 22 | 1X 40MM CIWS/MULTI PURP GUN | | | | | | |
| | | | 6.1 | 12.2 | | 32.3 | 33.5 |
| 23 | 21 CELL RAM LAUNCHER | | | | | | |
| | W720 | 0.0 | 4.0 | 4.0 | UNKNOWN | 44.0 | 44.0 |
| 26 | 40MM AMMO (MIXED) 3000 RNDS | | | | | | |
| | WF21 | 0.0 | 7.4 | | UNKNOWN | 24.7 | |
| 27 | 40MM AMMO (MIXED) -- 3000 RNDS | | | | | | |
| | | | 7.4 | 14.8 | | -7.0 | 8.9 |
| 29 | HELO AS565 PANTHER: (DOLPHIN) | | | | | | |
| | WF23 | 0.0 | 4.4 | 4.4 | UNKNOWN | 5.0 | 5.0 |
| 19 | LAMPS MKIV: AVIATION SUPPORT & SPARES | | | | | | |
| | WF26 | 0.0 | 2.0 | 2.0 | UNKNOWN | 33.8 | 33.8 |
| 30 | LAMPS MKIII: FUEL [JP-5] | | | | | | |
| | WF42 | 0.0 | 63.8 | 63.8 | UNKNOWN | 9.8 | 9.8 |

PRINTED REPORT NO. 11 - P+A WEIGHTS AND VCGS

| ROW | P+A WT KEY | WEIGHT ADD | WEIGHT FAC,LTON | VCG KEY | VCG ADD,FT | VCG FAC | |
|---|---|---|---|---|---|---|---|
| === | ====== | ======== | ======== | ===== | ======== | ==== | ==== |
| 15 | BALLIST | | | | | | |
| | W191 | 1.00 | 0.00 | BL | 1.00 | 1.00 | |
| 1 | CIC COMMAND AND DECISION MODFIG | | | | | | |
| | W410 | 7.00 | 0.00 | D6.5 | -7.22 | 0.00 | |
| 11 | CS HOLD UP BATTERY | | | | | | |
| | W410 | 30.00 | 0.00 | BL | 3.50 | 1.00 | |
| 3 | NAV SYS (1/2 DDG 51) | | | | | | |
| | W420 | 3.80 | -1.00 | D10 | 16.00 | 1.00 | |
| 2 | EXCOMM (1/2 DDG51) | | | | | | |
| | W440 | 16.00 | 0.00 | D10 | -8.20 | 1.00 | |
| 4 | SPS-67 SSR | | | | | | |
| | W451 | 1.75 | 0.00 | D10 | 29.50 | 1.00 | |
| 6 | MK XII AIMS IFF | | | | | | |
| | W455 | 2.30 | 0.00 | D10 | 30.00 | 1.00 | |
| 5 | SPY-3C (MINI-SPY) | | | | | | |
| | W456 | 18.00 | 0.00 | DM10 | 32.00 | 1.00 | |
| 9 | SLQ-32(V)3 ACTIVE/PASSIVE ECM | | | | | | |
| | W472 | 3.00 | 0.00 | D10 | 21.00 | 1.00 | |
| 8 | SLQ-25 NIXIE | | | | | | |
| | W473 | 3.60 | 0.00 | D20 | -8.00 | 1.00 | |
| 16 | OPER READINESS AND TEST SYS | | | | | | |
| | W491 | 3.00 | 0.00 | D10 | 2.50 | 1.00 | |
| 32 | ADMIN LAN | | | | | | |
| | W491 | 0.70 | 0.00 | BL | 30.00 | 0.00 | |
| 14 | CRANE | | | | | | |
| | W500 | 20.00 | 0.00 | D6.5 | 5.00 | 1.00 | |
| 12 | SENSOR COOLING SYSTEMS | | | | | | |

```
      W532        4.00      -1.00      BL         10.00       1.00
 17  RAST/TALON HELO COMBO
      W588        5.00       0.00      D20         2.00       1.00
 18  RAST CONTROL STATION
      W588        0.00       0.00      D20         0.00       0.00
 21  1X 40MM CIWS/MULTI PURP GUN
      W710        6.10       0.00      D6.5        3.00       1.00
 22  1X 40MM CIWS/MULTI PURP GUN
      W710        6.10       0.00      D15         3.00       1.00
 23  21 CELL RAM LAUNCHER
      W720        4.00       0.00      DM10       14.00       1.00
 26  40MM AMMO (MIXED) 3000 RNDS
      WF21        7.40       0.00      D6.5       -7.00       1.00
 27  40MM AMMO (MIXED) -- 3000 RNDS
      WF21        7.40       0.00      D15        -7.00       0.00
 29  HELO AS565 PANTHER: (DOLPHIN)
      WF23        4.40       0.00      D20         5.00       0.00
 19  LAMPS MKIV: AVIATION SUPPORT & SPARES
      WF26        2.00       0.00      D20         3.00       1.00
 30  LAMPS MKIII: FUEL [JP-5]
      WF42       63.80       0.00      BL          9.84       0.00
C,E>RUN,SPAC
COMMAND STRING IS:
  RUN,SPACE MODULE
```

ASSET/MONOSC VERSION 3.3+ - SPACE MODULE - 2/11/95 11.19.11.

PRINTED REPORT NO. 1 - SUMMARY

| | |
|---|---|
| COLL PROTECT SYSTEM-PRESENT | HAB STANDARD-NAVY |
| SONAR DOME-NONE | UNIT COMMANDER-NONE |

| | | | |
|---|---|---|---|
| FULL LOAD WT, LTON | 3813.2 | HAB STANDARD FAC | 0.000 |
| TOTAL CREW ACC | 122. | PASSWAY MARGIN FAC | 0.000 |
| HULL AVG DECK HT, FT | 10.57 | AC MARGIN FAC | 0.200 |
| MR VOLUME, FT3 | 48700. | SPACE MARGIN FAC | 0.050 |

| | AREA FT2 | | | VOL FT3 |
|---|---|---|---|---|
| | PAYLOAD REQUIRED | TOTAL REQUIRED | TOTAL AVAILABLE | TOTAL ACTUAL |
| DKHS ONLY | 991.0 | 4849.4 | 10307.8 | 104558. |
| HULL OR DKHS | 2670.0 | 34896.6 | 29531.5 | 387374. |
| TOTAL | 3661.0 | 39746.0 | 39839.2 | 491932. |

| SSCS GROUP | TOTAL AREA FT2 | DKHS AREA FT2 | PERCENT TOTAL AREA |
|---|---|---|---|
| 1. MISSION SUPPORT | 4985.4 | 1608.3 | 12.5 |
| 2. HUMAN SUPPORT | 7923.7 | 381.5 | 19.9 |
| 3. SHIP SUPPORT | 12144.9 | 1572.1 | 30.6 |
| 4. SHIP MOBILITY SYSTEM | 12799.3 | 1056.5 | 32.2 |
| 5. UNASSIGNED | 1892.7 | 230.9 | 4.8 |
| TOTAL | 39746.0 | 4849.4 | 100.0 |

PRINTED REPORT NO. 2 - MISSION SUPPORT AREA

| SSCS | GROUP | TOTAL AREA FT2 | DKHS AREA FT2 |
|---|---|---|---|
| 1. | MISSION SUPPORT | 4985.4 | 1608.3 |
| 1.1 | COMMAND,COMMUNICATION+SURV | 2869.7 | 1305.0 |
| 1.11 | EXTERIOR COMMUNICATIONS | 730.0 | 95.0 |

| | | | |
|---|---|---|---|
| *1.111 | RADIO | 730.0 | 95.0 |
| 1.112 | UNDERWATER SYSTEMS | | |
| 1.12 | SURVEILLANCE SYS | 570.0 | 470.0 |
| *1.121 | SURFACE SURV (RADAR) | 570.0 | 470.0 |
| 1.122 | UNDERWATER SURV (SONAR) | | |
| 1.13 | COMMAND+CONTROL | 1008.0 | 608.0 |
| *1.131 | COMBAT INFO CENTER | 400.0 | |
| 1.132 | CONNING STATIONS | 608.0 | 608.0 |
| 1.1321 | PILOT HOUSE | 528.0 | 528.0 |
| 1.1322 | CHART ROOM | 80.0 | 80.0 |
| 1.14 | COUNTERMEASURES | 192.0 | 132.0 |
| *1.141 | ELECTRONIC | 172.0 | 132.0 |
| *1.142 | TORPEDO | 20.0 | |
| 1.143 | MISSILE | | |
| 1.15 | INTERIOR COMMUNICATIONS | 339.4 | |
| 1.16 | ENVIRONMENTAL CNTL SUP SYS | 30.3 | |
| 1.2 | WEAPONS | 1144.0 | 244.0 |
| *1.21 | GUNS | 144.0 | 144.0 |
| *1.22 | MISSILES | 100.0 | 100.0 |
| 1.23 | ROCKETS | | |
| 1.24 | TORPEDOS | | |
| 1.25 | DEPTH CHARGES | | |
| *1.26 | MINES | 900.0 | |
| 1.27 | MULT EJECT RACK STOW | | |
| 1.28 | WEAP MODULE STA & SERV INTER | | |
| 1.3 | AVIATION | 625.0 | 50.0 |
| 1.31 | AVIATION LAUNCH+RECOVERY | 25.0 | |
| 1.311 | LAUNCHING+RECOVERY AREAS | | |
| *1.312 | LAUNCHING+RECOVERY EQUIP | 25.0 | |
| 1.32 | AVIATION CONTROL | | |
| 1.321 | FLIGHT CONTROL | | |
| 1.322 | NAVIGATION | | |
| 1.323 | OPERATIONS | | |
| 1.33 | AVIATION HANDLING | | |
| *1.34 | AIRCRAFT STOWAGE | 450.0 | |
| 1.35 | AVIATION ADMINISTRATION | | |
| *1.36 | AVIATION MAINTENANCE | 50.0 | 50.0 |
| 1.37 | AVIATION ORDINANCE | | |
| 1.372 | CONTROL | | |
| 1.373 | HANDLING | | |
| 1.374 | STOWAGE | | |
| 1.38 | AVIATION FUEL SYS | | |
| *1.39 | AVIATION STORES | 100.0 | |
| 1.4 | AMPHIBIOUS | | |
| 1.5 | CARGO | | |
| 1.6 | INTERMEDIATE MAINT FAC | 185.7 | |
| 1.64 | STOWAGE | 185.7 | |
| 1.641 | WEAPONS | 185.7 | |
| 1.7 | FLAG FACILITIES | | |
| 1.73 | HANDLING | | |
| 1.74 | STOWAGE | | |
| 1.8 | SPECIAL MISSIONS | | |
| 1.9 | SM ARMS,PYRO+SALU BAT | 161.0 | 9.3 |
| 1.91 | SM ARMS (LOCKER) | 40.8 | |
| 1.92 | PYROTECHNICS (LOCKER) | 9.3 | 9.3 |
| 1.93 | SALUTING BAT (MAGAZINE) | 13.8 | |
| 1.95 | SECURITY FORCE EQUIP | 97.1 | |

PRINTED REPORT NO. 3 - HUMAN SUPPORT AREA

HAB STD = NAVY

| SSCS | GROUP | TOTAL AREA FT2 | DKHS AREA FT2 |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 2. | HUMAN SUPPORT | 7923.7 | 381.5 |
| 2.1 | LIVING | 4403.5 | 340.0 |
| 2.11 | OFFICER LIVING | 1565.0 | 340.0 |
| 2.111 | BERTHING | 1360.0 | 260.0 |
| 2.1111 | SHIP OFFICER | 1360.0 | 260.0 |
| 2.1115 | FLAG OFFICER | | |
| 2.112 | SANITARY | 205.0 | 80.0 |
| 2.1121 | SHIP OFFICER | 205.0 | 80.0 |
| 2.1125 | FLAG OFFICER | | |
| 2.12 | CPO LIVING | 592.5 | |
| 2.121 | BERTHING | 465.0 | |
| 2.122 | SANITARY | 127.5 | |
| 2.13 | CREW LIVING | 2097.0 | |
| 2.131 | BERTHING | 1800.0 | |
| 2.132 | SANITARY | 297.0 | |
| 2.133 | RECREATION | | |
| 2.1332 | LIBRARY | | |
| 2.14 | GENERAL SANITARY FACILITIES | 110.0 | |
| 2.141 | LADIES RETIRING ROOM | 80.0 | |
| 2.142 | BRIDGE WASHROOM+WC | 15.0 | |
| 2.143 | DECK WASHROOM+WC | 15.0 | |
| 2.15 | SHIP RECREATION FAC | 39.0 | |
| 2.152 | MOTION PIC FILM+EQUIP | 24.4 | |
| 2.153 | PHYSICAL FITNESS | 14.6 | |
| 2.154 | TV ROOM | | |
| 2.16 | TRAINING | | |
| 2.2 | COMMISSARY | 2316.7 | |
| 2.21 | FOOD SERVICE | 1448.0 | |
| 2.211 | OFFICER (MESS+LOUNGE) | 496.6 | |
| 2.212 | CPO (MESS+LOUNGE) | 394.0 | |
| 2.213 | CREW (MESS+LOUNGE) | 557.4 | |
| 2.22 | COMMISSARY SERVICE SPACES | 544.6 | |
| 2.23 | FOOD STORAGE+ISSUE | 324.2 | |
| 2.231 | CHILL PROVISIONS | 79.4 | |
| 2.232 | FROZEN PROVISIONS | 77.7 | |
| 2.233 | DRY PROVISIONS | 167.0 | |
| 2.234 | ISSUE | | |
| 2.3 | MEDICAL+DENTAL (MEDICAL) | 300.0 | |
| 2.4 | GENERAL SERVICES | 523.2 | |
| 2.41 | SHIP STORE FACILITIES | 244.6 | |
| 2.411 | SHIP STORE | 61.0 | |
| 2.416 | SHIP STORE STORES | 183.6 | |
| 2.42 | LAUNDRY FACILITIES | 186.7 | |
| 2.43 | DRY CLEANING | | |
| 2.44 | BARBER SERVICE | 80.0 | |
| 2.46 | POSTAL SERVICE | | |
| 2.47 | BRIG | | |
| 2.48 | RELIGIOUS | 12.0 | |
| 2.5 | PERSONNEL STORES | 150.4 | 41.5 |
| 2.51 | BAGGAGE | 21.4 | |
| 2.52 | MESSROOM STORES | 59.0 | 11.5 |
| 2.55 | FOUL WEATHER GEAR (LOCKER) | 30.0 | 30.0 |
| 2.57 | FOLDING CHAIR STOREROOM | 40.0 | |
| 2.6 | CBR PROTECTION | 209.8 | |
| 2.61 | CBR DECON STATIONS | | |
| 2.62 | CBR DEFENSE EQP STRMS | 209.8 | |
| 2.63 | CPS AIRLOCKS | | |
| 2.7 | LIFESAVING EQUIPMENT | 20.0 | |
| 2.71 | LIFEJACKET LOCKER | 20.0 | |

PRINTED REPORT NO. 4 - SHIP SUPPORT AREA

| SSCS | GROUP | TOTAL AREA FT2 | DKHS AREA FT2 |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 3. | SHIP SUPPORT | 12144.9 | 1572.1 |
| 3.1 | SHIP CNTL SYS(STEERING&DIVING) | 564.0 | |
| 3.2 | DAMAGE CONTROL | 371.6 | |
| 3.22 | REPAIR STATIONS | 179.6 | |
| 3.25 | FIRE FIGHTING | 192.0 | |
| 3.3 | SHIP ADMINISTRATION | 959.3 | |
| 3.5 | DECK AUXILIARIES | 687.6 | 212.9 |
| 3.51 | ANCHOR HANDLING | 302.5 | |
| 3.52 | LINE HANDLING | 172.2 | |
| 3.53 | TRANSFER-AT-SEA | 212.9 | 212.9 |
| 3.6 | SHIP MAINTENANCE | 1128.0 | |
| 3.61 | ENGINEERING DEPT | 694.4 | |
| 3.611 | AUX (FILTER CLEANING) | 90.0 | |
| 3.612 | ELECTRICAL | 98.4 | |
| 3.613 | MECH (GENERAL WK SHOP) | 446.0 | |
| 3.614 | PROPULSION MAINTENANCE | 60.0 | |
| 3.62 | OPERATIONS DEPT (ELECT SHOP) | 304.6 | |
| 3.63 | WEAPONS DEPT (ORDINANCE SHOP) | 59.0 | |
| 3.64 | DECK DEPT (CARPENTER SHOP) | 70.0 | |
| 3.7 | STOWAGE | 2039.4 | |
| 3.71 | SUPPLY DEPT | 1548.3 | |
| 3.711 | HAZARDOUS MATL | 134.7 | |
| 3.712 | SPECIAL CLOTHING | 46.1 | |
| 3.713 | GEN USE CONSUM+REPAIR PART | 861.1 | |
| 3.714 | MISCELLANEOUS | 34.2 | |
| 3.715 | STORES HANDLING | 472.2 | |
| 3.72 | ENGINEERING DEPT | 28.3 | |
| 3.73 | OPERATIONS DEPT | 39.5 | |
| 3.74 | DECK DEPT (BOATSWAIN STORES) | 350.0 | |
| 3.75 | WEAPONS DEPT | 25.2 | |
| 3.76 | EXEC DEPT (MASTER-AT-ARMS STOR) | 29.3 | |
| 3.78 | CLEANING GEAR STOWAGE | 18.9 | |
| 3.8 | ACCESS (INTERIOR-NORMAL) | 6395.1 | 1359.3 |

PRINTED REPORT NO. 5 - SHIP MACHINERY SYSTEM AREA

| SSCS | GROUP | TOTAL AREA FT2 | DKHS AREA FT2 |
|---|---|---|---|
| 4. | SHIP MACHINERY SYSTEM | 12799.3 | 1056.5 |
| 4.1 | PROPULSION SYSTEM | 2391.6 | 378.2 |
| 4.13 | INTERNAL COMBUSTION | 676.1 | 68.0 |
| 4.132 | COMBUSTION AIR | | |
| 4.133 | EXHAUST | 136.1 | 68.0 |
| 4.134 | CONTROL | 540.0 | |
| 4.14 | GAS TURBINE | 1715.5 | 310.1 |
| 4.142 | COMBUSTION AIR | 266.1 | 133.0 |
| 4.143 | EXHAUST | 509.5 | 177.1 |
| 4.144 | CONTROL | 940.0 | |
| 4.17 | AUX PROPULSION SYSTEMS | | |
| 4.2 | PROPULSOR & TRANSMISSION SYST | | |
| 4.3 | AUX MACHINERY | 10407.7 | 678.3 |
| 4.31 | GENERAL (AUX MACH DELTA) | 8258.6 | |
| 4.32 | A/C & REFRIGERATION | 1422.0 | 678.3 |
| 4.321 | A/C (INCL VENT) | 1324.8 | 678.3 |
| 4.322 | REFRIGERATION | 97.2 | |
| 4.33 | ELECTRICAL | 246.6 | |
| 4.331 | POWER GENERATION | 119.7 | |
| 4.3311 | SHIP SERVICE PWR GEN | | |
| 4.3314 | 400 HERTZ | 119.7 | |
| 4.332 | PWR DIST & CNTRL | 1.9 | |
| 4.334 | DEGAUSSING | 125.0 | |

| | | |
|---|---|---|
| 4.34 | POLUTION CONTROL SYSTEMS | 134.4 |
| 4.35 | MECHANICAL SYSTEMS | 346.0 |

PRINTED REPORT NO. 6 - REQUIRED TANKAGE

POLLUTION CNTRL IND-PRESENT

| | |
|---|---|
| ENDURANCE FUEL, FT3 | 24003. |
| AVIATION FUEL, FT3 | 2814. |
| FRESH WATER, FT3 | 653. |
| SEWAGE, FT3 | 245. |
| WASTE OIL WATER, FT3 | 480. |
| CLEAN BALLAST, FT3 | 0. |
| TANKAGE MARGIN, FT3 | 0. |
| | -------- |
| TANKAGE VOL REQ, FT3 | 28194. |

C,E>RUN,DESIGN
COMMAND STRING IS:
RUN,DESIGN SUMMARY

ASSET/MONOSC VERSION 3.3+ - DESIGN SUMMARY - 2/11/95 11.21.00.

PRINTED REPORT NO. 1 - SUMMARY

SHIP COMMENT TABLE

PRINCIPAL CHARACTERISTICS - FT

| | |
|---|---|
| LBP | 380.0 |
| LOA | 398.3 |
| BEAM, DWL | 51.0 |
| BEAM, WEATHER DECK | 54.5 |
| DEPTH @ STA 10 | 30.0 |
| DRAFT TO KEEL DWL | 15.6 |
| DRAFT TO KEEL LWL | 15.1 |
| FREEBOARD @ STA 3 | 19.3 |
| GMT | 6.1 |
| CP | 0.570 |
| CX | 0.795 |

SPEED(KT): MAX= 26.0 SUST= 25.0
ENDURANCE: 8000.0 NM AT 14.0 KTS

TRANSMISSION TYPE: ELECT
MAIN ENG: 2 RGT @ 15108.4 HP

SHAFT POWER/SHAFT: 13636.6 HP
PROPELLERS: 2 - FP - 11.6 FT DIA

SEP GEN: 2 D DIESEL @ 2737.5 KW

| | |
|---|---|
| 24 HR LOAD | 1075.0 |
| MAX MARG ELECT LOAD | 2563.6 |

| | OFF | CPO | ENL | TOTAL |
|---|---|---|---|---|
| MANNING | 15 | 13 | 82 | 110 |
| ACCOM | 17 | 15 | 90 | 122 |

WEIGHT SUMMARY - LTON

| | |
|---|---|
| GROUP 1 - HULL STRUCTURE | 1289.7 |
| GROUP 2 - PROP PLANT | 272.3 |
| GROUP 3 - ELECT PLANT | 248.0 |
| GROUP 4 - COMM + SURVEIL | 129.8 |
| GROUP 5 - AUX SYSTEMS | 516.9 |
| GROUP 6 - OUTFIT + FURN | 307.2 |
| GROUP 7 - ARMAMENT | 20.6 |
| SUM GROUPS 1-7 | 2784.5 |
| DESIGN MARGIN | 347.9 |
| LIGHTSHIP WEIGHT | 3132.4 |
| LOADS | 680.8 |
| FULL LOAD DISPLACEMENT | 3813.2 |
| FULL LOAD KG: FT | 19.5 |
| MILITARY PAYLOAD WT - LTON | 191.5 |
| USABLE FUEL WT - LTON | 517.1 |

AREA SUMMARY - FT2

| | |
|---|---|
| HULL AREA - | 29531.5 |
| SUPERSTRUCTURE AREA - | 10307.8 |
| TOTAL AREA | 39839.2 |

VOLUME SUMMARY - FT3

| | |
|---|---|
| HULL VOLUME - | 387373.8 |
| SUPERSTRUCTURE VOLUME - | 104558.4 |
| TOTAL VOLUME | 491932.2 |

PRINTED REPORT NO. 2 - MANNING AND ACCOMMODATION SUMMARY

CREW ACCOM MARGIN FAC 0.10

| | SHIPS CREW | AIR DETACH | FLAG STAFF /OTHER | TOTAL MANNING | TOTAL ACCOMMODATION |
|---|---|---|---|---|---|
| OFFICERS | 11. | 4. | 0. | 15. | 17. |
| CPO | 12. | 1. | 0. | 13. | 15. |
| OEM | 76. | 6. | 0. | 82. | 90. |
| TOTAL | 99. | 11. | 0. | 110. | 122. |

PRINTED REPORT NO. 3 - INDICATORS

MISSION
  DESIGN MODE IND-ENDURANCE
  ENDUR DISP IND -AVG DISP
  ENDUR DEF IND -USN
  SUSTN SPEED IND-GIVEN
  ENDUR SPEED IND-GIVEN
HULL FORM FACTORS
  HULL OFFSETS IND-GIVEN
  HULL DIM IND -GEOSIM
HULL BOUNDARY CONDITIONS
  HULL BC IND -CONV DD
  HULL STA IND -OPTIMUM
SHELL APPENDAGES
  BILGE KEEL IND -PRESENT
  SKEG IND -PRESENT
MARGIN LINE
  MARGIN LINE IND-CALC
HULL SUBDIVISION FACTORS
  HULL SUBDIV IND-CALC
INNER BOTTOM
  INNER BOTTOM IND-PRESENT
HULL LOADS
  HULL LOADS IND -CALC
  SHOCK FNDTN IND-SHOCK
STRUCTURAL ARANGEMENT
  BOT PLATE LIMIT IND-CALC
STIFFENERS
  STIFFENER SHAPE IND-CALC
DKHS GEOM FACTORS
  DKHS GEOM IND -GENERATE
  DKHS SIZE IND -AUTO X
DKHS MATERIALS
  DKHS MTRL TYPE IND-HTS
  FIRE PROTECT IND -NONE
DKHS LOADS
  BLAST RESIST IND-7 PSI
ARRANGEMENT TYPES
  MECH CL ARR IND -
  MECH PORT ARR IND -
  MECH STBD ARR IND -
  ELECT PG ARR 1 IND-M-PG
  ELECT PG ARR 2 IND-
  ELECT DL ARR IND -MTR
ARRANGEMENT CG
  MACHY KG IND -CALC
ENGINE CONFIG FACTORS
  ENG ENDUR RPM IND -CALC
  SEC ENG USAGE IND -
  ENDUR CONFIG IND -NO TS
  GT ENG ENCL IND -84 DBA

GEARS
  SEC ENG 2 SPD GEAR IND-
  GEAR IMPED MASS IND -NONE
PROPULSION SHAFTING
  SHAFT SUPPORT TYPE IND-POD
  SHAFT SYS SIZE IND -CALC
PROPULSION SHAFT BEARING
  THRUST BRG LOC IND-CALC
PROPELLER FACTORS
  PROP TYPE IND -FP
  PROP SERIES IND-ANALYTIC
  PROP DIA IND -CALC
  PROP AREA IND -CALC
  PROP LOC IND -CALC
  PITCH RATIO IND-CALC
OPEN WATER PROP DATA
  PROP ID IND -
PROPULSION SUPPORT SYS
  INLET TYPE IND -PLENUM
  DUCT SILENCING IND -BOTH
  EXHAUST IR SUPP IND-PRESENT
SS GENERATOR FACTORS
  SS SYS TYPE IND-SEP
  FREQ CONV IND -
SS GENERATOR SIZE
  SS GEN SIZE IND-NON STD
SS ENGINES
  SS ENG SELECT IND -GIVEN
  SS ENG MODEL IND -A-12V270
  SS ENG TYPE IND -D DIESEL
  SS ENG SFC EQN IND-DIESEL
  SS ENG SIZE IND -CALC
SONAR SYSTEM
  SONAR DOME IND -NONE
  SONAR DRAG IND -
CLIMATE CONTROL

  COLL PROTECT SYS IND-PRESENT
  REFER MACHY LOC IND -OUTSIDE
  AUX BOILER TYPE IND -ELECTRIC
SEA WATER SYSTEMS

AIR AND MISC FLUID SYSTEM

RUDDERS
  RUDDER SIZE IND-CALC
  RUDDER TYPE IND-SPADE
ROLL FINS
  FIN SIZE IND -CALC

```
  DIESEL ENG MOUNT IND-COMPOUND
MAIN ENGINES
  MAIN ENG SELECT IND-GIVEN
  MAIN ENG MOD IND -GE-LM1600-VAN2
  MAIN ENG TYPE IND  -RGT
  MAIN ENG SFC EQ IND-POLY QN
  MAIN ENG SIZE IND  -CALC
SEC ENGINES
  SEC ENG SELECT IND -
  SEC ENG MODEL IND  -
  SEC ENG TYPE IND   -
  SEC ENG SFC EQN IND-
  SEC ENG SIZE IND   -
TRANSMISSION FACTORS
  TRANS TYPE IND -ELECT
  TRANS EFF IND  -CALC
ELECTRICAL TRANSMISSION
  ELECT PRPLN TYPE IND  -ACR-DCS
  ELECT PRPLN RATIND IND-CALC
  AC SYNC ROTOR COOL IND-AIR
  TRANS LINE NODE PT IND-CALC
  SWITCHGEAR TYPE IND   -ADV

REPLENISHMENT SYSTEMS

SPECIAL PURPOSE SYSTEMS
  POLLUTION CNTL IND-PRESENT
OUTFIT AND FURNISHINGS
  UNIT CMDR IND   -NONE

FUELS AND LUBRICANTS
  SHIP FUEL TYPE IND-JP-5
RESISTANCE FACTORS
  FRICTION LINE IND    -ITTC
  RESID RESIST IND     -NRC
  WORM CURVE IND       -
  PRPLN SYS RESIST IND-CALC
SHIP WEIGHT
  SHIP LCG INPUT IND-CALC

PRINTED REPORT NO. 4 - MARGINS

HULL
  MIN FREEBOARD MARGIN, FT            .25
  HULL MARGIN STRESS, KSI            2.24


PROPULSION PLANT
  TORQUE MARGIN FAC                 1.200

ELECTRIC PLANT
  ELECT LOAD DES MARGIN FAC          .200
  ELECT LOAD SL MARGIN FAC           .100

AUXILIARY SYSTEMS
  AC MARGIN FAC                      .200

OUTFIT AND FURNISHINGS
  CREW ACCOM MARGIN FAC              .100

WEIGHT MARGINS
  GROWTH WT MARGIN, LTON              .0
  D+B WT MARGIN, LTON                 .0
  D+B WT MARGIN FAC                  .125
  D+B KG MARGIN, FT                  .00
  D+B KG MARGIN FAC                  .125

RESISTANCE FACTORS
  DRAG MARGIN FAC                    .080

SPACE FACTORS
  SPACE MARGIN FAC                   .050
  PASSWAY MARGIN FAC                 .000
  TANKAGE MARGIN FAC                 .000

PRINTED REPORT NO. 5 - PAYLOAD AND ADJUSTMENTS

 ROW  PAYLOAD AND ADJUSTMENT NAME
 ===  ===================================
  1   CIC COMMAND AND DECISION MODFIG
  2   EXCOMM (1/2 DDG51)
  3   NAV SYS (1/2 DDG 51)
```

```
 4  SPS-67 SSR
 5  SPY-3C (MINI-SPY)
 6  MK XII AIMS IFF
 8  SLQ-25 NIXIE
 9  SLQ-32(V)3 ACTIVE/PASSIVE ECM
11  CS HOLD UP BATTERY
12  SENSOR COOLING SYSTEMS
14  CRANE
15  BALLIST
16  OPER READINESS AND TEST SYS
17  RAST/TALON HELO COMBO
18  RAST CONTROL STATION
19  LAMPS MKIV: AVIATION SUPPORT & SPARES
21  1X 40MM CIWS/MULTI PURP GUN
22  1X 40MM CIWS/MULTI PURP GUN
23  21 CELL RAM LAUNCHER
24  LONGITUDNAL BULKHEADS AROUND MAGAZINE
26  40MM AMMO (MIXED) 3000 RNDS
27  40MM AMMO (MIXED) -- 3000 RNDS
29  HELO AS565 PANTHER: (DOLPHIN)
30  LAMPS MKIII: FUEL [JP-5]
32  ADMIN LAN
34  AVIATION STORES
36  MINE DETECTION HULL MOUNTED SONAR
```

| ROW | WT KEY | WT ADD LTON | WT FAC | VCG KEY | VCG ADD FT | VCG FAC |
|---|---|---|---|---|---|---|
| 1 | W410 | 7.00 | .000 | D6.5 | -7.22 | .000 |
| 2 | W440 | 16.00 | .000 | D10 | -8.20 | 1.000 |
| 3 | W420 | 3.80 | -1.000 | D10 | 16.00 | 1.000 |
| 4 | W451 | 1.75 | .000 | D10 | 29.50 | 1.000 |
| 5 | W456 | 18.00 | .000 | DM10 | 32.00 | 1.000 |
| 6 | W455 | 2.30 | .000 | D10 | 30.00 | 1.000 |
| 8 | W473 | 3.60 | .000 | D20 | -8.00 | 1.000 |
| 9 | W472 | 3.00 | .000 | D10 | 21.00 | 1.000 |
| 11 | W410 | 30.00 | .000 | BL | 3.50 | 1.000 |
| 12 | W532 | 4.00 | -1.000 | BL | 10.00 | 1.000 |
| 14 | W500 | 20.00 | .000 | D6.5 | 5.00 | 1.000 |
| 15 | W191 | 1.00 | .000 | BL | 1.00 | 1.000 |
| 16 | W491 | 3.00 | .000 | D10 | 2.50 | 1.000 |
| 17 | W588 | 5.00 | .000 | D20 | 2.00 | 1.000 |
| 18 | W588 | .00 | .000 | D20 | .00 | .000 |
| 19 | WF26 | 2.00 | .000 | D20 | 3.00 | 1.000 |
| 21 | W710 | 6.10 | .000 | D6.5 | 3.00 | 1.000 |
| 22 | W710 | 6.10 | .000 | D15 | 3.00 | 1.000 |
| 23 | W720 | 4.00 | .000 | DM10 | 14.00 | 1.000 |
| 24 | NONE | .00 | .000 | BL | .00 | .000 |
| 26 | WF21 | 7.40 | .000 | D6.5 | -7.00 | 1.000 |
| 27 | WF21 | 7.40 | .000 | D15 | -7.00 | .000 |
| 29 | WF23 | 4.40 | .000 | D20 | 5.00 | .000 |
| 30 | WF42 | 63.80 | .000 | BL | 9.84 | .000 |
| 32 | W491 | .70 | .000 | BL | 30.00 | .000 |
| 34 | NONE | 2.00 | .000 | D20 | 3.00 | .000 |
| 36 | NONE | 2.00 | .000 | BL | .00 | .000 |

| ROW | AREA KEY | ---AREA ADD, FT2-- HULL/SS | SS/ONLY | -----AREA FAC----- HULL/SS | SS/ONLY |
|---|---|---|---|---|---|
| 1 | A1131 | 400.00 | .00 | .000 | .000 |
| 2 | A1111 | 635.00 | 95.00 | .000 | .000 |
| 3 | NONE | .00 | .00 | .000 | .000 |
| 4 | A1121 | .00 | 70.00 | .000 | .000 |
| 5 | A1121 | 100.00 | 400.00 | .000 | .000 |
| 6 | A1121 | .00 | .00 | .000 | .000 |

| | | | | | |
|---|---|---|---|---|---|
| 8 | A1142 | 20.00 | .00 | .000 | .000 |
| 9 | A1141 | 40.00 | 132.00 | .000 | .000 |
| 11 | NONE | 250.00 | .00 | .000 | .000 |
| 12 | NONE | .00 | .00 | .000 | .000 |
| 14 | A1260 | 900.00 | .00 | .000 | .000 |
| 15 | NONE | .00 | .00 | .000 | .000 |
| 16 | NONE | .00 | .00 | .000 | .000 |
| 17 | A1312 | 25.00 | .00 | .000 | .000 |
| 18 | A1312 | .00 | .00 | .000 | .000 |
| 19 | A1360 | .00 | 50.00 | .000 | .000 |
| 21 | A1210 | .00 | 72.00 | .000 | .000 |
| 22 | A1210 | .00 | 72.00 | .000 | .000 |
| 23 | A1220 | .00 | 100.00 | .000 | .000 |
| 24 | NONE | .00 | .00 | .000 | .000 |
| 26 | NONE | .00 | .00 | .000 | .000 |
| 27 | NONE | .00 | .00 | .000 | .000 |
| 29 | A1340 | 450.00 | .00 | .000 | .000 |
| 30 | A1380 | .00 | .00 | .000 | .000 |
| 32 | NONE | .00 | .00 | .000 | .000 |
| 34 | A1390 | 100.00 | .00 | .000 | .000 |
| 36 | NONE | 12.00 | .00 | .000 | .000 |

| | KW | --------KW ADD, | KW--------- | | ------------KW FAC---------- | | |
|---|---|---|---|---|---|---|---|
| ROW | KEY | W CRUISE | W BATTLE | S CRUISE | W CRUISE | W BATTLE | S CRUISE |
| === | ==== | ======== | ======== | ======== | ======== | ======== | ======== |
| 1 | NONE | 4.00 | 10.00 | 4.00 | .000 | .000 | .000 |
| 2 | NONE | 4.00 | 7.00 | 5.00 | .000 | .000 | .000 |
| 3 | NONE | 8.20 | 10.30 | 8.20 | .000 | .000 | .000 |
| 4 | C+S | 8.00 | 7.00 | 8.00 | .000 | .000 | .000 |
| 5 | C+S | 90.00 | 475.00 | 90.00 | .000 | .000 | .000 |
| 6 | C+S | 3.20 | 4.00 | 3.20 | .000 | .000 | .000 |
| 8 | NONE | 3.00 | 4.20 | 3.00 | .000 | .000 | .000 |
| 9 | C+S | 6.40 | 66.00 | 6.40 | .000 | .000 | .000 |
| 11 | NONE | 2.00 | .00 | 2.00 | .000 | .000 | .000 |
| 12 | NONE | 8.00 | 8.00 | 8.00 | .000 | .000 | .000 |
| 14 | NONE | .00 | 25.00 | .00 | .000 | .000 | .000 |
| 15 | NONE | .00 | .00 | .00 | .000 | .000 | .000 |
| 16 | NONE | 12.00 | 1.00 | 12.00 | .000 | .000 | .000 |
| 17 | UNRE | .00 | 10.00 | .00 | .000 | .000 | .000 |
| 18 | UNRE | .00 | 1.00 | .00 | .000 | .000 | .000 |
| 19 | NONE | .00 | .00 | .00 | .000 | .000 | .000 |
| 21 | ARM | 4.00 | 16.00 | 4.00 | .000 | .000 | .000 |
| 22 | ARM | 4.00 | 16.00 | 4.00 | .000 | .000 | .000 |
| 23 | ARM | 2.00 | 5.00 | 2.00 | .000 | .000 | .000 |
| 24 | NONE | .00 | .00 | .00 | .000 | .000 | .000 |
| 26 | NONE | .00 | .00 | .00 | .000 | .000 | .000 |
| 27 | NONE | .00 | .00 | .00 | .000 | .000 | .000 |
| 29 | ARM | .00 | 25.00 | .00 | .000 | .000 | .000 |
| 30 | NONE | .00 | .00 | .00 | .000 | .000 | .000 |
| 32 | NONE | 1.00 | .00 | 1.00 | .000 | .000 | .000 |
| 34 | NONE | .00 | .00 | .00 | .000 | .000 | .000 |
| 36 | NONE | 5.00 | 1.00 | 5.00 | .000 | .000 | .000 |

```
** WARNING - PERFORMANCE ANALYSIS ** (W-DEFAULTVALUES-PRFMPL)
THE FOLLOWING PARAMETERS WERE PROVIDED DEFAULT VALUES:
     ELECT DL ARR NO ARRAY              PERF DISP IND
     SIG WAVE HT                        MONTHS IN SERVICE
     MSN SPEED ARRAY                    MSN SPEED PROB ARRAY
     SIG WAVE HT ARRAY                  SEA STATE PROB ARRAY
     HULL FOULING FAC                   PROP FOULING FAC
** WARNING - PERFORMANCE ANALYSIS ** (W-CANTMAKEMAXSPDWV-PRFMSN)
 AVAILABLE POWER FROM MAIN ENGINES IS INADEQUATE TO MEET THE MAXIMUM
MISSION SPEED AT WAVE HEIGHTS OF  0.0 FT OR GREATER.
```

ASSET/MONOSC VERSION 3.3+ - PERFORMANCE ANALYSIS - 2/11/95 11.22.08.

PRINTED REPORT NO. 1 - SUMMARY

| | | | |
|---|---|---|---|
| PERF DISP IND | FULL LOAD | MAIN ENG NO | 2. |
| TOWED BODY IND | NONE | MAIN ENG TYPE IND | RGT |
| SHIP FUEL TYPE IND | JP-5 | MAIN ENG PWR AVAIL, HP | 15108. |
| PROP TYPE IND | FP | SEC ENG NO | 0. |
| NO PROP SHAFTS | 2. | SEC ENG TYPE IND | |
| SIG WAVE HT, FT | 0.00 | SEC ENG PWR AVAIL, HP | |
| MONTHS IN SERVICE | 0.00 | SS ENG NO | 2. |
| HULL FOULING FAC | 0.011 | SS ENG TYPE IND | D DIESEL |
| PROP FOULING FAC | 0.000 | 24 HR AVG ELECT LOAD, KW | 1075.0 |
| ANNUAL FUEL USAGE, BBL | | | |

SPEED PERFORMANCE SUMMARY

| SPEED KT | DRAG LBF | RANGE NM | REQ BHP HP | PRPLN ENG MN | O/L SC | SFC LBM/HP-HR | FUEL FLOW LTON/HR | FUEL CONS NM/LTON | PROP COEF | TRNSP EFF |
|---|---|---|---|---|---|---|---|---|---|---|
| 14.0 | 54127. | 9289. | 3532. | 1 | 0 | .540 | .78 | 18.0 | 0.722 | 103.9 |
| 15.0 | 59431. | 8989. | 4138. | 1 | 0 | .510 | .86 | 17.4 | 0.725 | 95.0 |
| 16.0 | 65659. | 8585. | 4863. | 1 | 0 | .485 | .96 | 16.6 | 0.727 | 86.2 |
| 17.0 | 73875. | 8012. | 5812. | 1 | 0 | .462 | 1.09 | 15.5 | 0.727 | 76.7 |
| 18.0 | 83575. | 7368. | 6968. | 1 | 0 | .444 | 1.26 | 14.2 | 0.726 | 67.7 |
| 19.0 | 94317. | 6717. | 8316. | 1 | 0 | .431 | 1.46 | 13.0 | 0.725 | 59.9 |
| 20.0 | 105344. | 6122. | 9797. | 1 | 0 | .423 | 1.68 | 11.8 | 0.725 | 53.5 |
| 21.0 | 116941. | 5565. | 11440. | 1 | 0 | .419 | 1.94 | 10.8 | 0.724 | 48.1 |
| 22.0 | 131730. | 4901. | 13552. | 2 | 0 | .421 | 2.31 | 9.5 | 0.723 | 42.6 |
| 23.0 | 150355. | 4416. | 16266. | 2 | 0 | .408 | 2.68 | 8.5 | 0.719 | 37.1 |
| 24.0 | 173210. | 3890. | 19706. | 2 | 0 | .399 | 3.18 | 7.5 | 0.715 | 31.9 |
| 25.0 | 201849. | 3326. | 24172. | 2 | 0 | .397 | 3.87 | 6.4 | 0.709 | 27.1 |
| 26.0 | 237229. | 2750. | 29935. | 2 | 0 | .404 | 4.87 | 5.3 | 0.701 | 22.8 |
| 26.0 | 238919. | 2725. | 30216. | 2 | 0 | .405 | 4.93 | 5.3 | 0.700 | 22.6 |

PRINTED REPORT NO. 2 - MISSION PERFORMANCE SUMMARY

ANNUAL FUEL USAGE, BBL 28963.

| MISSION PROFILE SPEED KT | PERCENT | SIG WAV HT-FT | PERCENT | RANGE NM | FUEL FLOW LTON/HR | FUEL CONS NM/LTON | PROPUL COEF | TRNSP EFF |
|---|---|---|---|---|---|---|---|---|
| 6.0 | 11.9 | 0.0 | 1.7 | | | | | |
| 14.0 | 46.6 | 4.0 | 15.7 | | | | | |
| 20.0 | 35.6 | 6.5 | 11.6 | 7662. | 1.28 | 14.8 | 0.718 | 121.8 |
| 25.0 | 4.4 | 10.2 | 42.0 | | | | | |
| 30.0 | 1.5 | 17.0 | 29.0 | | | | | |
| 15.8 | | 10.6 | | | | | | |

PRINTED REPORT NO. 3 - DETAILED MISSION PERFORMANCE

SIG WAVE HT, FT = 0.0
PROBABILITY OF
OCCURANCE, PCNT = 1.7

| SPEED KT | PROBABILITY PCNT | DRAG LBF | REQ PROP HP | FUEL CONS NM/LTON |
|---|---|---|---|---|
| 6.0 | 11.9 | 11446. | 325. | 18.8 |
| 14.0 | 46.6 | 54127. | 3532. | 18.0 |
| 20.0 | 35.6 | 105344. | 9797. | 11.8 |
| 25.0 | 4.4 | 201849. | 24172. | 6.4 |
| 26.0 | 1.5 | 238851. | 30217. | 5.3 |

SIG WAVE HT, FT = 4.0
PROBABILITY OF
OCCURANCE, PCNT = 15.7

| SPEED KT | PROBABILITY PCNT | DRAG LBF | REQ PROP HP | FUEL CONS NM/LTON |
|---|---|---|---|---|
| 6.0 | 11.9 | 11472. | 326. | 18.8 |
| 14.0 | 46.6 | 54250. | 3541. | 17.9 |
| 20.0 | 35.6 | 105584. | 9822. | 11.8 |
| 25.0 | 4.4 | 202308. | 24234. | 6.4 |
| 26.0 | 1.5 | 238919. | 30217. | 5.3 |

SIG WAVE HT, FT = 6.5
PROBABILITY OF
OCCURANCE, PCNT = 11.6

| SPEED KT | PROBABILITY PCNT | DRAG LBF | REQ PROP HP | FUEL CONS NM/LTON |
|---|---|---|---|---|
| 6.0 | 11.9 | 11534. | 328. | 18.8 |
| 14.0 | 46.6 | 54541. | 3562. | 17.9 |
| 20.0 | 35.6 | 106150. | 9880. | 11.8 |
| 25.0 | 4.4 | 203394. | 24383. | 6.4 |
| 26.0 | 1.5 | 239078. | 30217. | 5.3 |

SIG WAVE HT, FT = 10.2
PROBABILITY OF
OCCURANCE, PCNT = 42.0

| SPEED KT | PROBABILITY PCNT | DRAG LBF | REQ PROP HP | FUEL CONS NM/LTON |
|---|---|---|---|---|
| 6.0 | 11.9 | 11717. | 334. | 18.7 |
| 14.0 | 46.6 | 55405. | 3625. | 17.7 |
| 20.0 | 35.6 | 107831. | 10052. | 11.6 |
| 25.0 | 4.4 | 206615. | 24824. | 6.3 |
| 25.9 | 1.5 | 239547. | 30217. | 5.2 |

SIG WAVE HT, FT = 17.0
PROBABILITY OF
OCCURANCE, PCNT = 29.0

| SPEED KT | PROBABILITY PCNT | DRAG LBF | REQ PROP HP | FUEL CONS NM/LTON |
|---|---|---|---|---|
| 6.0 | 11.9 | 12415. | 357. | 18.5 |
| 14.0 | 46.6 | 58710. | 3866. | 17.0 |
| 20.0 | 35.6 | 114263. | 10720. | 10.9 |
| 25.0 | 4.4 | 218939. | 26532. | 5.8 |
| 25.6 | 1.5 | 241297. | 30217. | 5.2 |

```
C,E>RUN,HYDRO
COMMAND STRING IS:
  RUN,HYDROSTATIC ANALYSIS
** FATAL ERROR - HYDROSTATIC ANALYSIS ** (E-INVALIDDATA-HYSMPL)
THE FOLLOWING PARAMETERS CONTAIN INVALID OR MISSING DATA:
    COMP DEF IND                       COMP SYM INDEX ARRAY
    DAMAGED COMP ARRAY

** ENTERING PROMPT MODE **
ENTER 'QUIT' TO RETURN TO COMMAND LEVEL.

      COMP DEF IND              =
ALLOWABLE OPTIONS ARE:
  1 GIVEN                            2 CALC
PLEASE ENTER OPTION NUMBER OR OPTION STRING.
I>

      COMP SYM INDEX ARRAY      = ( 21X   1)
  1 0.1000E+37
PLEASE ENTER ARRAY INPUT COMMANDS.
I>

      DAMAGED COMP ARRAY        = ( 21X   1)
  1 0.1000E+37
PLEASE ENTER ARRAY INPUT COMMANDS.
I>
C,E>RUN,SEAK
COMMAND STRING IS:
  RUN,SEAKEEPING ANALYSIS
** WARNING - SEAKEEPING ANALYSIS ** (W-BALRNKRNG1-SEARNK)
```

```
AT THE FULL LOAD DRAFT,
THE FOLLOWING HULL FORM PARAMETERS ARE OUT OF THE
RANGE OF THE BALES DATA:
    CUT-UP/LBP                  ****** % OUT OF RANGE
    VERT. PRISMATIC COEF AFT    -13.45 % OUT OF RANGE

  ASSET/MONOSC VERSION 3.3+ - SEAKEEPING ANALYSIS - 2/11/95  11.23.50.

PRINTED REPORT NO. 1 - SUMMARY

APPENDAGE IND-WITH

FULL LOAD WT, LTON    3813.2

                                                     FULL LOAD
                                                     ----------
BALES RANK
 RANK OF THE SYNTHESIZED SHIP (ACTUAL DISP)            1.828
 RANK OF THE SYNTHESIZED SHIP (NORMALIZED)             3.104
 RANK OF THE CLOSEST DATA BASE HULL (NORMALIZED)       3.460
 ID NO OF CLOSEST DATA BASE SHIP                           3
MCCREIGHT RANK
 RANK OF THE SYNTHESIZED SHIP (ACTUAL SHIP)            4.191
 RANK OF THE CLOSEST DATA BASE HULL                    3.991
 ID NO OF CLOSEST DATA BASE SHIP                          32

PRINTED REPORT NO. 2 - SHIP GEOMETRY DATA

FULL LOAD WT, LTON  3813.2

                                FULL LOAD
                               ------------
ACTUAL SHIP
 LBP, FT                          380.00
 BEAM, FT                          50.47
 DRAFT, FT                         15.12
 VERT PRISMATIC COEF (FWD)        0.7310
 VERT PRISMATIC COEF (AFT)        0.5323
 WATERPLANE COEF (FWD)            0.5832
 WATERPLANE COEF (AFT)            0.8888
 WP AREA AFT MIDSHIPS, FT2       8524.01
 LCB FROM FP, FT                  196.94
 LCF FROM FP, FT                  216.76
 BML, FT                          876.94
 CUT-UP PT FROM FP, FT             32.19

NORMALIZED SHIP
 DISP, LTON                       4232.1
 LBP, FT                          393.43
 BEAM, FT                          52.26
 DRAFT, FT                         15.65
 CUT-UP PT FROM FP, FT             33.33
C,E>RUN,COST
COMMAND STRING IS:
  RUN,COST ANALYSIS
** WARNING - COST ANALYSIS ** (W-DEFAULTVALUES-CSTMPL)
THE FOLLOWING PARAMETERS WERE PROVIDED DEFAULT VALUES:
    PAYLOAD T+E COST                    LEAD PAYLOAD COST
    FOLLOW PAYLOAD COST                 ANNUAL TRNG ORD COST
    PAYLOAD FUEL RATE                   TECH ADV COST
    ADDL FACILITY COST                  DEFERRED MMHRS REQ
    UNREP UNIT CAPACITY                 UNREP UNIT COST
    UNREP O+S COST                      KN FACTOR ARRAY
    SHIP FUEL RATE
```

ASSET/MONOSC VERSION 3.3+ - COST ANALYSIS - 2/11/95 11.24.13.

NOTE-THIS INTERIM MODULE PROVIDES GUIDANCE FOR DECISIONS REGARDING SHIP DESIGN TRADEOFFS AND COMPARATIVE EVALUATIONS. REQUESTS FOR ESTIMATES OF SHIP COSTS FOR BUDGETARY PURPOSES SHOULD BE DIRECTED TO NAVSEA.

PRINTED REPORT NO. 1 - SUMMARY

| | | | |
|---|---|---|---|
| YEAR $ | 1995. | NO OF SHIPS ACQUIRED | 100. |
| INFLATION ESCALATION FAC | 1.513 | SERVICE LIFE, YR | 30.0 |
| LEARNING RATE | 0.970 | ANNUAL OPERATING HRS | 3000.0 |
| FUEL COST, $/GAL | 1.000 | MILITARY P/L, LTON | 191.5 |
| PAYLOAD FUEL RATE, LTON/HR | 0.33 | LIGHTSHIP WT, LTON | 3132.4 |
| SHIP FUEL RATE, LTON/HR | 0.90 | FULL LOAD WT, LTON | 3813.2 |

| COST ITEM | COSTS(MILLIONS OF DOLLARS) TOT SHIP | + PAYLOAD | = TOTAL |
|---|---|---|---|
| LEAD SHIP | 508.4 | 99.7* | 608.1 |
| FOLLOW SHIP | 240.4 | 90.7* | 331.1 |
| AVG ACQUISITION COST/SHIP(** SHIPS) | 208.9 | 90.8* | 299.7 |
| LIFE CYCLE COST/SHIP(30 YEARS) | | | 819.8 |
| TOTAL LIFE CYCLE COST(30 YEARS) | | | 81979.8 |
| DISCOUNTED LIFE CYCLE COST/SHIP | | | 47.8** |
| DISCOUNTED TOTAL LIFE CYCLE COST | | | 4781.8** |

*ESTIMATED VALUE
**DISCOUNTED AT 10 PERCENT

PRINTED REPORT NO. 2 - UNIT ACQUISITION COSTS

| SWBS GROUP | | UNITS | INPUTS | KN FACTORS | LEAD SHIP COSTS $K | FOLLOW SHIP COSTS $K |
|---|---|---|---|---|---|---|
| 100 | HULL STRUCTURE | LTON | 1289.7 | 1.00 | 12938. | 12162. |
| 200 | PROPULSION PLANT | HP | 30216.9 | 2.35 | 27505. | 25855. |
| 300 | ELECTRIC PLANT | LTON | 248.0 | 1.00 | 17137. | 16109. |
| 400 | COMMAND+SURVEILLANCE | LTON | 129.8 | 3.15 | 10426. | 9800. |
| 500 | AUX SYSTEMS | LTON | 516.9 | 1.53 | 29030. | 27288. |
| 600 | OUTFIT+FURNISHINGS | LTON | 307.2 | 1.00 | 13295. | 12498. |
| 700 | ARMAMENT | LTON | 20.6 | 1.00 | 251. | 236. |
| | MARGIN | LTON | 347.9 | | 13818. | 12989. |
| 800 | DESIGN+ENGINEERING | | | 26.06 | 188892. | 20872. |
| 900 | CONSTRUCTION SERVICES | | | 4.25 | 32942. | 30966. |
| | TOTAL CONSTRUCTION COST | | | | 346235. | 168775. |
| | CONSTRUCTION COST | | | | 346235. | 168775. |
| | PROFIT(10.0 PERCENT OF CONSTRUCTION COST) | | | | 34624. | 16877. |
| | PRICE | | | | 380859. | 185652. |
| | CHANGE ORDERS(12/8 PERCENT OF PRICE) | | | | 45703. | 14852. |
| | NAVSEA SUPPORT(2.5 PERCENT OF PRICE) | | | | 9521. | 4641. |
| | POST DELIVERY CHARGES(5 PERCENT OF PRICE) | | | | 19043. | 9283. |
| | OUTFITTING(4 PERCENT OF PRICE) | | | | 15234. | 7426. |
| | H/M/E + GROWTH(10 PERCENT OF PRICE) | | | | 38086. | 18565. |
| | TOTAL SHIP COST | | | | 508447. | 240419. |
| | ESTIMATED PAYLOAD COST | | | | 99700. | 90703. |
| SHIP PLUS PAYLOAD COST | | | | | 608146. | 331122. |

ADJUSTED FIRST UNIT SHIP COST, $K 255765.4
COMBAT SYSTEM WEIGHT, LTON 191.5

```
PROPULSION SYSTEM WEIGHT, LTON          272.3
ADJUSTED FIRST UNIT SHIP COST EQUALS
 FOLLOW SHIP TOTAL COST DIVIDED BY      0.940
```

PRINTED REPORT NO. 3 - LIFE CYCLE COSTS

| | | | |
|---|---|---|---|
| IOC YEAR | 2010. | PAYLOAD FUEL RATE, LTON/HR | 0.33 |
| R+D PROGRAM LENGTH, YRS | 10. | SHIP FUEL RATE, LTON/HR | 0.90 |
| NUMBER OF SHIPS ACQUIRED | 100. | TECH ADV COST, $M | 0.00 |
| SERVICE LIFE, YRS | 30. | ADDL FACILITY COST, $M | 0.00 |
| NO OF OFFICERS/SHIP | 15. | DEFERRED MMHRS REQ, HR/WK | 0. |
| NO OF ENLISTED MEN/SHIP | 95. | PRODUCTION RATE, SHIPS/YR | 8.00 |

30 - YEAR SYSTEMS COST
(MILLIONS OF YEAR 1995 DOLLARS)

| COST ELEMENT | SHIP NONREC | PAYLOAD NONREC | OTHER NONREC | TOTAL NONREC | SYSTEM RECUR | TOTAL SYSTEM |
|---|---|---|---|---|---|---|
| R+D TOTAL | 458. | 15. | 0. | 473. | | 473. |
| DESIGN+DEVELMNT | 169. | | 0. | 169. | | 169. |
| TEST+EVALUATION | 290. | 15. | 0. | 305. | | 305. |
| INVESTMENT | 22562. | 12075. | 49. | 34687. | | 34687. |
| EQUIPMENT | 21935. | 10895. | | 32830. | | 32830. |
| PRIME | 20891. | 9079. | | 29970. | | 29970. |
| SUPPORT | 1045. | 1816. | | 2860. | | 2860. |
| FACILITIES | | | 0. | 0. | | 0. |
| INITIAL SPARES | 627. | 1180. | | 1807. | | 1807. |
| ASSOCIATED SYS | | | 49. | 49. | | 49. |
| OPERATIONS+SUPPRT | | | | | 49456. | 49456. |
| PERSONNEL | | | | | 6757. | 6757. |
| OPERATIONS | | | | | 4018. | 4018. |
| MAINTENANCE | | | | | 17152. | 17152. |
| ENERGY | | | | | 2782. | 2782. |
| REPL SPARES | | | | | 11746. | 11746. |
| MAJOR SUPPORT | | | | | 6821. | 6821. |
| ASSOCIATED SYS | | | | | 181. | 181. |
| LESS RESIDUAL VALUE | | | | | | 2637. |
| LIFE CYCLE TOTAL SYSTEMS COST | | | | | | 81980. |
| DISCOUNTED AT 10 PERCENT | | | | | | 4782. |

```
COST PER VEHICLE-UNDISCOUNTED      820.
COST PER VEHICLE-DISCOUNTED         48.
C,E>RUN,MANN
COMMAND STRING IS:
  RUN,MANNING ANALYSIS

   ASSET/MONOSC VERSION 3.3+ - MANNING ANALYSIS - 2/11/95  11.24.28.

NOTE-THIS INTERIM MANNING MODEL PROVIDES GROSS TREND ANALYSIS
     BASED ON HISTORICAL MANNING DATA OF EXISTING SHIPS.
     REQUESTS FOR SHIP MANNING DETERMINATION SHOULD BE
     DIRECTED TO NAVSEA.
```

PRINTED REPORT NO. 1 - SUMMARY

FULL LOAD WT, LTON 3813.2

| | | | |
|---|---|---|---|
| TOTAL MMHRS REQ/WK | 6696.1 | NO WATCH STATIONS | 5. |
| TOTAL MMHRS AVAIL/WK | 5920.0 | NO WATCHSTANDERS | 14. |
| DEFERRED MMHRS/WK | 776.1 | NO NON-WATCHSTANDERS | 74. |

| | OFFICERS | CPO | ENLISTED | TOTAL |
|---|---|---|---|---|
| REQ MANNING | 11. | 11. | 101. | 123. |
| AVAIL MANNING | 15. | 13. | 82. | 110. |
| DIFFERENCE | 4. | 2. | -19. | -13. |
| ACCOMMODATIONS | 17. | 15. | 90. | 122. |

PRINTED REPORT NO. 2 - MANNING AND ACCOMMODATION SUMMARY

CREW ACCOM MARGIN FAC 0.10

| | SHIPS CREW | AIR DETACH | FLAG STAFF /OTHER | ACCOMMODATION |
|---|---|---|---|---|
| OFFICERS | 11. | 4. | 0. | 17. |
| CPO | 12. | 1. | 0. | 15. |
| OEM | 76. | 6. | 0. | 90. |
| TOTAL | 99. | 11. | 0. | 122. |

PRINTED REPORT NO. 3 - DEPARTMENTAL MANNING ANALYSIS

| DEPARTMENT | MANNING FACTOR | OFFICERS | CPO | ENLISTED | TOTAL |
|---|---|---|---|---|---|
| CO/EXEC/NAV/MED | 0.7 | 1. | 2. | 10. | 13. |
| OPERATIONS | 0.5 | 1. | 2. | 24. | 27. |
| COMBAT | 0.5 | 2. | 3. | 20. | 25. |
| ENGINEERING | 0.8 | 2. | 2. | 27. | 31. |
| SUPPLY | 0.5 | 1. | 1. | 14. | 16. |
| AVIATION | 1.0 | 4. | 1. | 6. | 11. |
| FLAG STAFF/OTHER | --- | 0. | 0. | 0. | 0. |
| REQ MANNING | | 11. | 11. | 101. | 123. |
| AVAIL MANNING | | 15. | 13. | 82. | 110. |
| DIFFERENCE | | 4. | 2. | -19. | -13. |

PRINTED REPORT NO. 4 - WEEKLY FUNCTIONAL WORKLOAD ANALYSIS

| FUNCTION | WORKLOAD FACTOR | WEEKLY MHRS REQ | WEEKLY MHRS AVAIL | PERCENT |
|---|---|---|---|---|
| OPERATIONAL MANNING (OM) | 0.5 | 2199.1 | | 32.8 |
| PLANNED MAINTENANCE (PM) + CORRECTIVE MAINTENANCE (CM) | 0.5 | 681.7 | | 10.2 |
| OWN UNIT SUPPORT (OUS) | 0.5 | 1360.8 | | 20.3 |
| FACILITY MAINTENANCE (FM) | 0.5 | 479.4 | | 7.2 |
| PRODUCTIVITY ALLOWANCE (PA) | 1.0 | 504.4 | | 7.5 |
| SERVICE DIVERSION ALLOWANCE (SDA) + TRAINING (T) | 1.5 | 1470.7 | | 22.0 |
| TOTAL MMHRS REQ/WK | | 6696.1 | | 100.0 |
| WATCHSTANDERS (74HRS/MAN-WK) | | | 1036.0 | |
| NON-WATCHSTANDERS (66HRS/MAN-WK) | | | 4884.0 | |
| TOTAL MMHRS AVAIL/WK | | | 5920.0 | 88.4 |
| DEFERRED MMHRS/WK | | | 776.1 | 11.6 |

```
C,E>EXIT
DO YOU WISH TO SAVE CURRENT MODEL (Y/N)?
I>  N
DO YOU WISH TO EXIT PROGRAM (Y/N)?
I>  Y
```

# APPENDIX O

## ASSET DIAGRAMS

# Summary and Contents

Appendix O contains the printed graphics displays from the ASSET runs compile by the CPCX design team. The printed reports are broken down as follows:

Section 1, Common Reports between Variants

- Hull Geometry Graphic Display No. 1 - Body Plan
- Hull Geometry Graphic Display No. 2 - Hull Isometric View
- Hull Geometry Graphic Display No. 3 - Hull Profile and Weatherdeck Plan View
- Hull Geometry Graphic Display No. 4 - Design Waterline Plan View
- Hull Geometry Graphic Display No. 5 - Hull Sectional Area Curve
- Hull Subdivision Graphic Display No. 1 - Midship Section
- Hull Subdivision Graphic Display No. 2 - Hull Decks and Platforms (Main Deck)
- Hull Subdivision Graphic Display No. 3 - Hull Decks and Platforms (2nd Deck)
- Hull Subdivision Graphic Display No. 4 - Hull Decks and Platforms (1st Platform)
- Hull Structure Graphic Display No. 1 - Midship Section
- Hull Structure Graphic Display No. 2 - Segment Node Points
- Appendage Graphic Display No. 1 - Hull Profile and Plan View with Appendages
- Appendage Graphic Display No. 2 - Fwd Fin Tip Position
- Propeller Graphic Display No. 2 - Transverse Section
- Machinery Graphic Display No. 1 - Ship Machinery Layout
- Machinery Graphic Display No. 2 - Machinery Box
- Machinery Graphic Display No. 3 - MR Plan Views (MMR1 & MMR2)
- Machinery Graphic Display No. 4 - MR Profile Views (MMR1 & MMR2)
- Machinery Graphic Display No. 5 - Propulsion Appendages Profile View

Section 2, Navy Variant Specific Reports

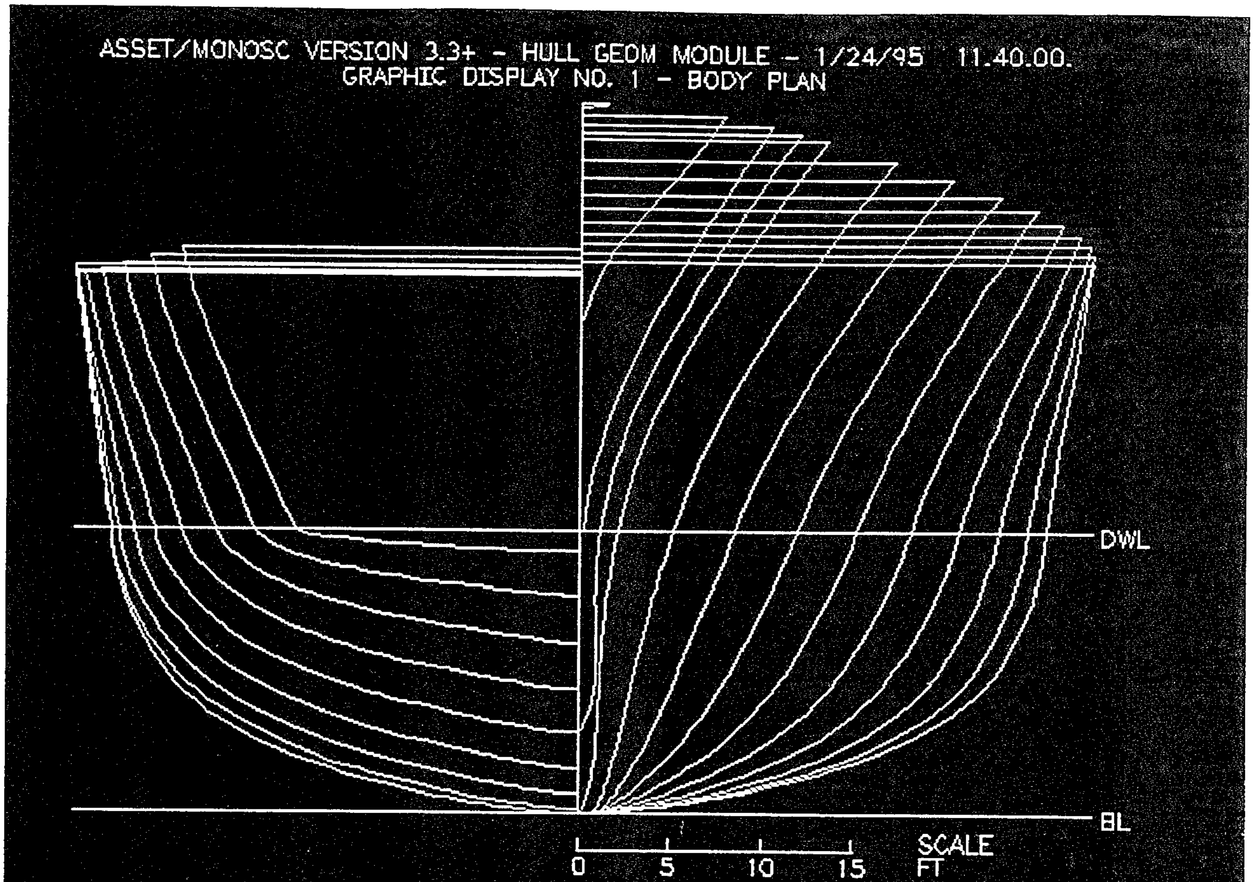
- Resistance Graphics Display No. 1 - Resistance Versus Speed
- Resistance Graphics Display No. 2 - EHP Versus Speed (3980 Lt & 3810 Lt))
- Performance Analysis Graphic Display No. 1 - Drag Versus Speed
- Performance Analysis Graphic Display No. 2 - Range Versus Speed
- Performance Analysis Graphic Display No. 3 - Total Power Versus Speed
- Performance Analysis Graphic Display No. 4 - SFC Versus Speed
- Performance Analysis Graphic Display No. 5 - Fuel Flow Versus Speed
- Performance Analysis Graphic Display No. 6 - Fuel Consumption Versus Speed
- Performance Analysis Graphic Display No. 7 - Propulsive Coefficient Versus Speed
- Performance Analysis Graphic Display No. 8 - Transport Efficiency Versus Speed

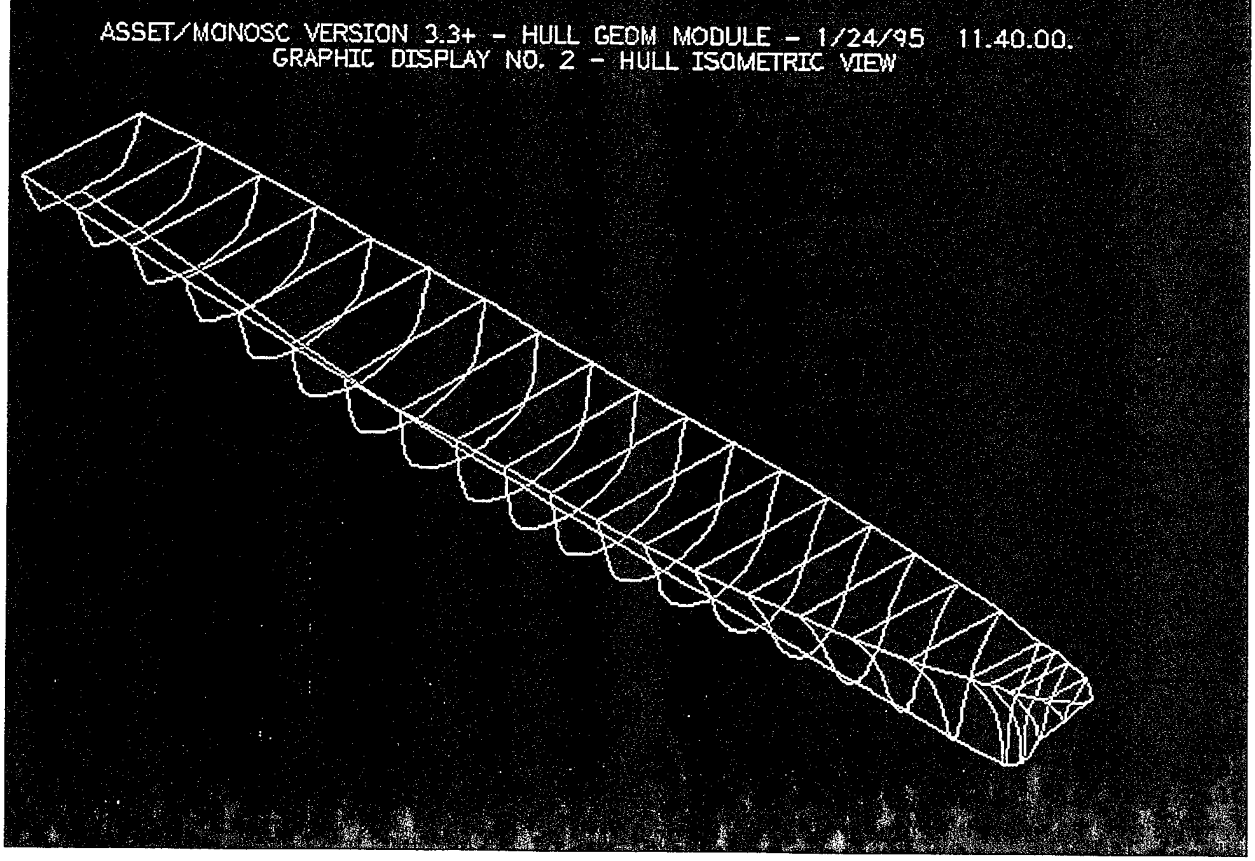
Section 3, Coast Guard Variant Specific Reports

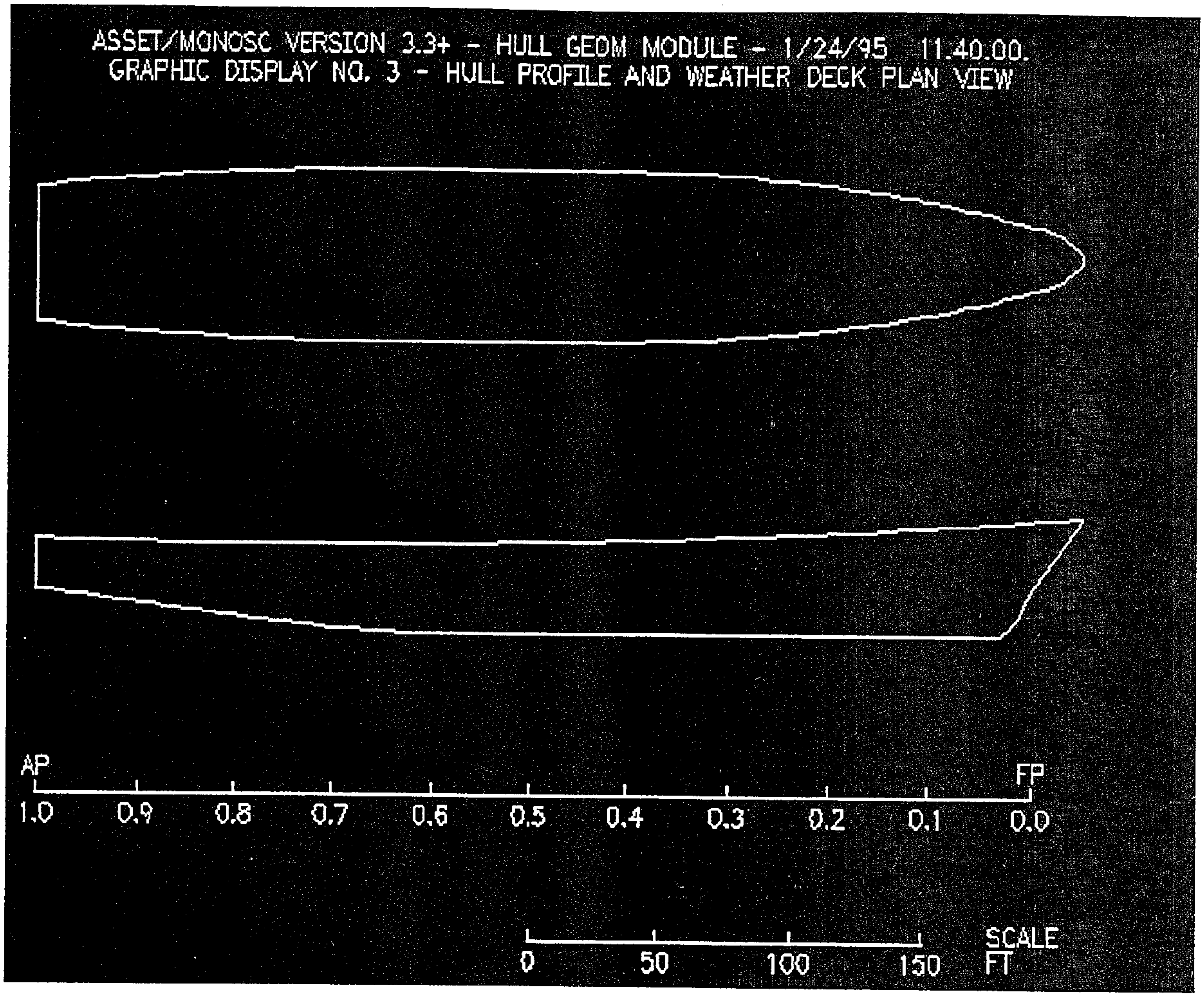
- Resistance Graphics Display No. 1 - Resistance Versus Speed
- Resistance Graphics Display No. 2 - EHP Versus Speed (3813 Lt & 3591 Lt)
- Performance Analysis Graphic Display No. 1 - Drag Versus Speed
- Performance Analysis Graphic Display No. 2 - Range Versus Speed
- Performance Analysis Graphic Display No. 3 - Total Power Versus Speed
- Performance Analysis Graphic Display No. 4 - SFC Versus Speed
- Performance Analysis Graphic Display No. 5 - Fuel Flow Versus Speed
- Performance Analysis Graphic Display No. 6 - Fuel Consumption Versus Speed

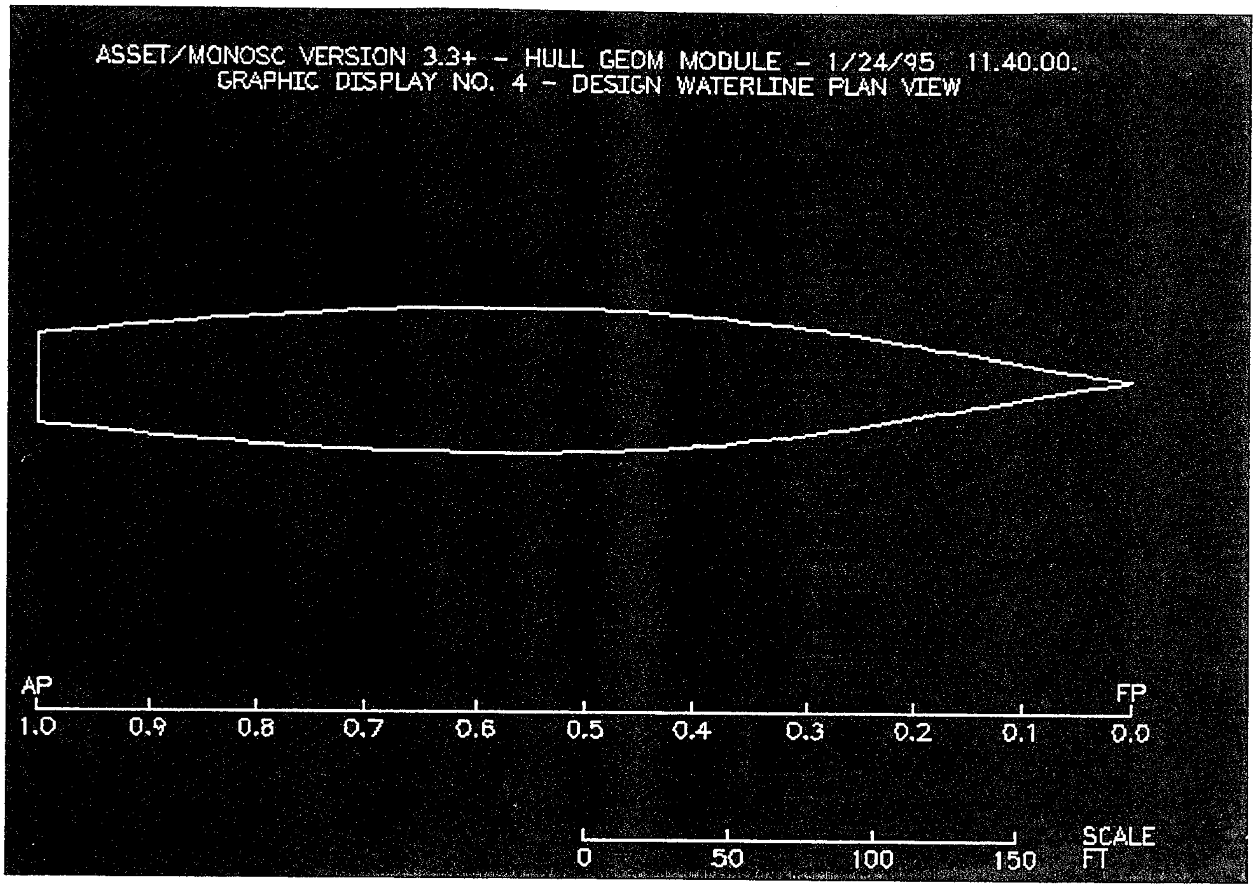
# SECTION 1

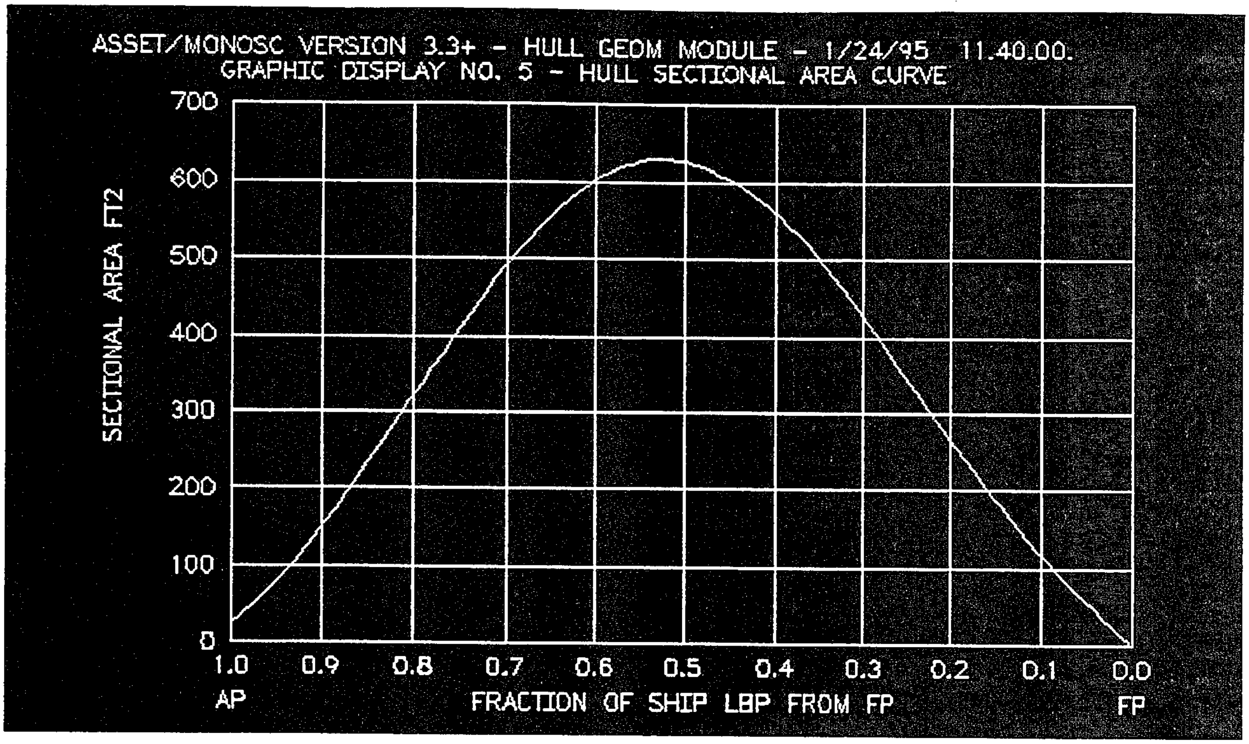
# COMMON REPORTS BETWEEN VARIANTS

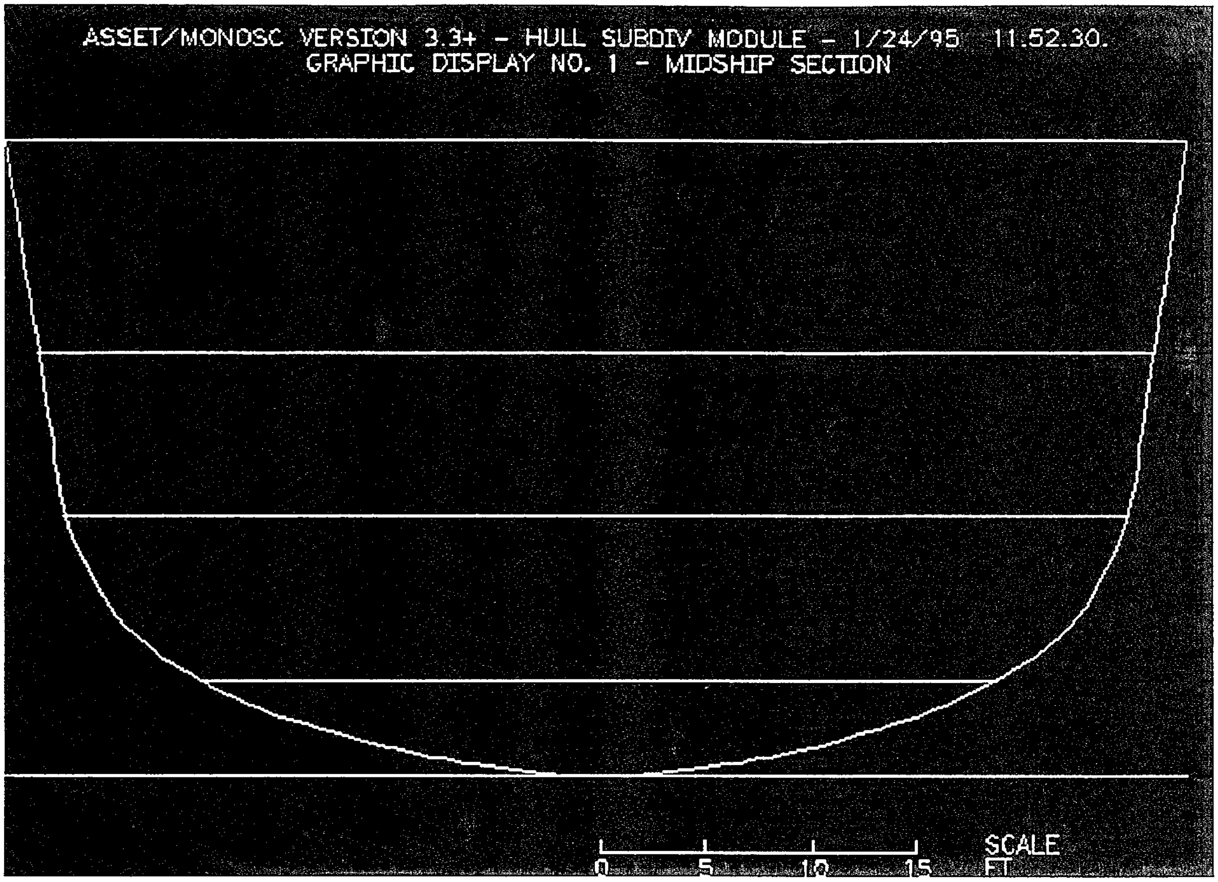

ASSET/MONOSC VERSION 3.3+ - HULL GEOM MODULE - 1/24/95 11.40.00.
GRAPHIC DISPLAY NO. 1 - BODY PLAN
DWL
BL
SCALE
FT
0
5
10
15

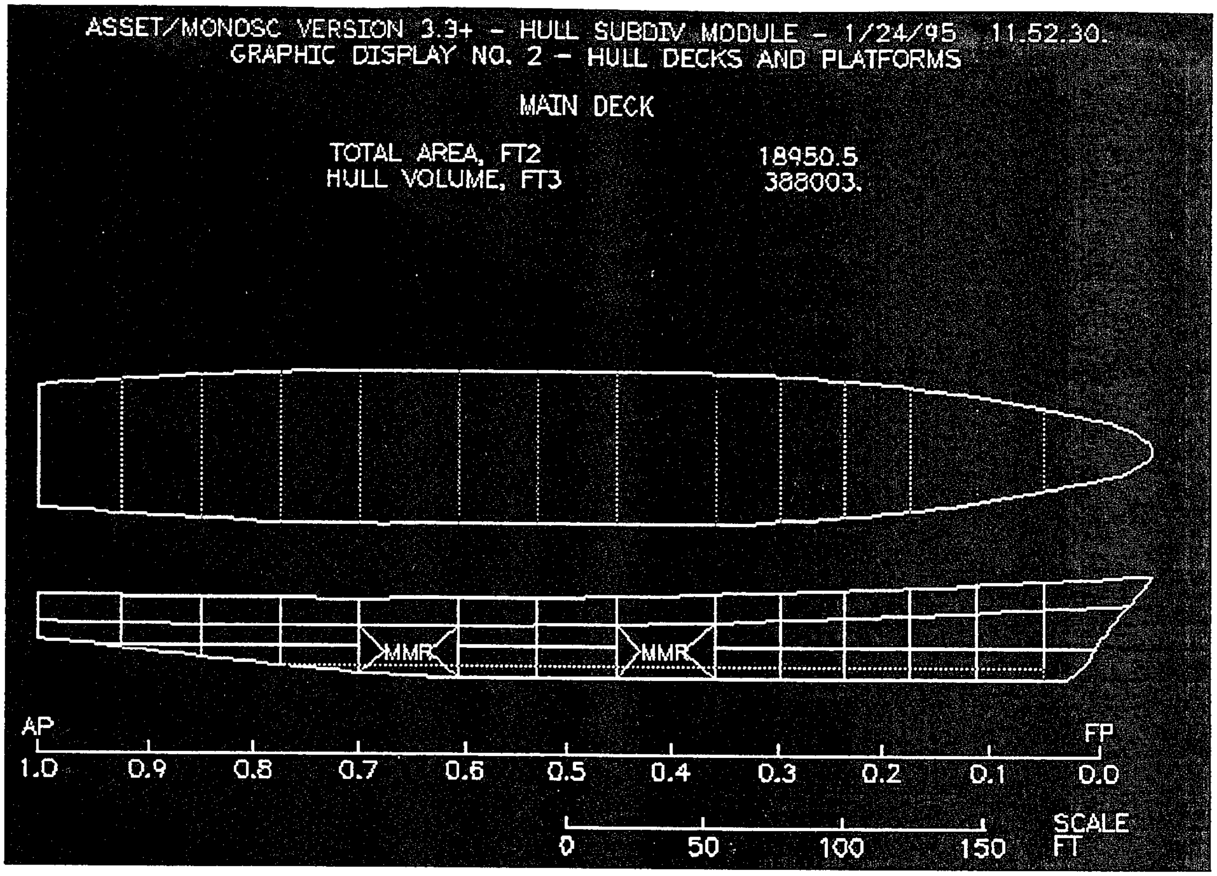

ASSET/MONOSC VERSION 3.3+ - HULL GEOM MODULE - 1/24/95 11.40.00.
GRAPHIC DISPLAY NO. 2 - HULL ISOMETRIC VIEW

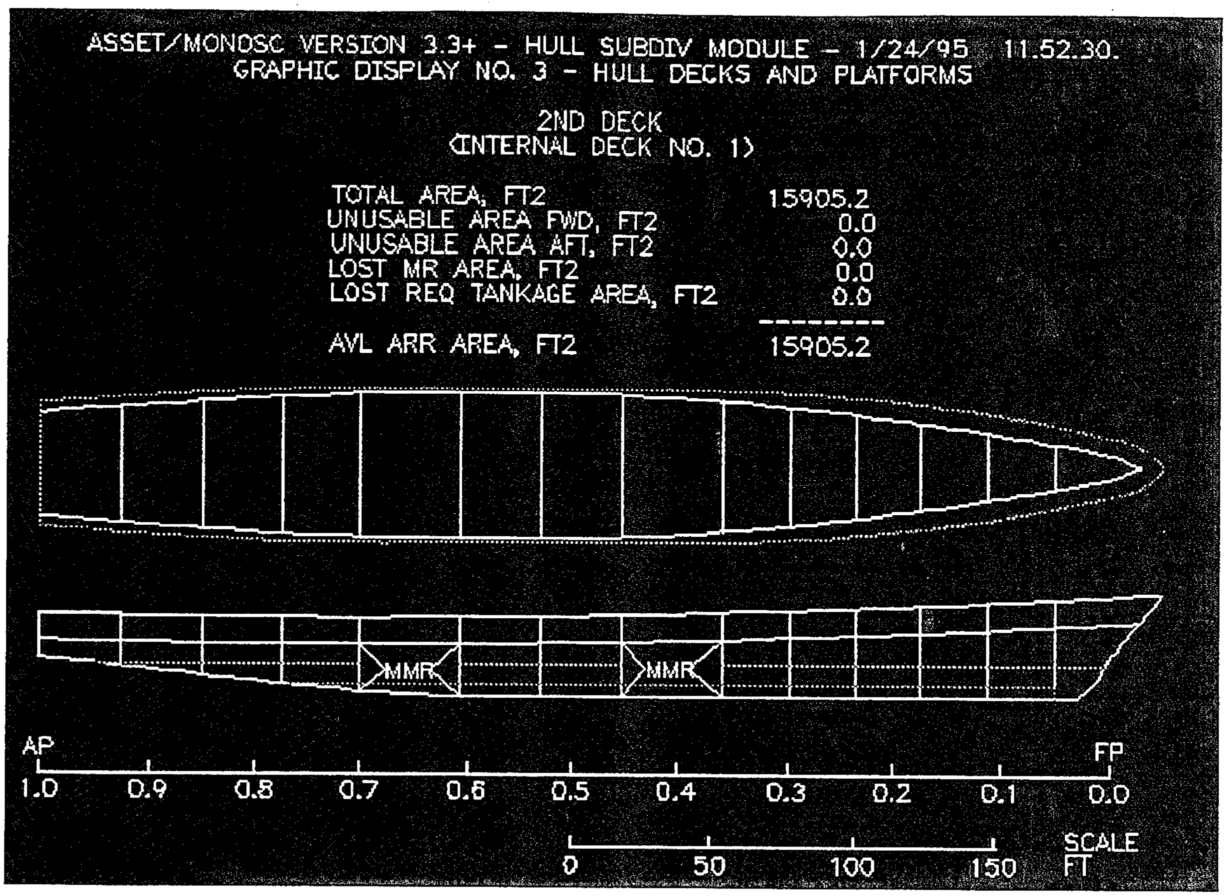

ASSET/MONOSC VERSION 3.3+ - HULL GEOM MODULE - 1/24/95 11.40.00.
GRAPHIC DISPLAY NO. 3 - HULL PROFILE AND WEATHER DECK PLAN VIEW
AP
FP
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
50
100
150
SCALE
FT

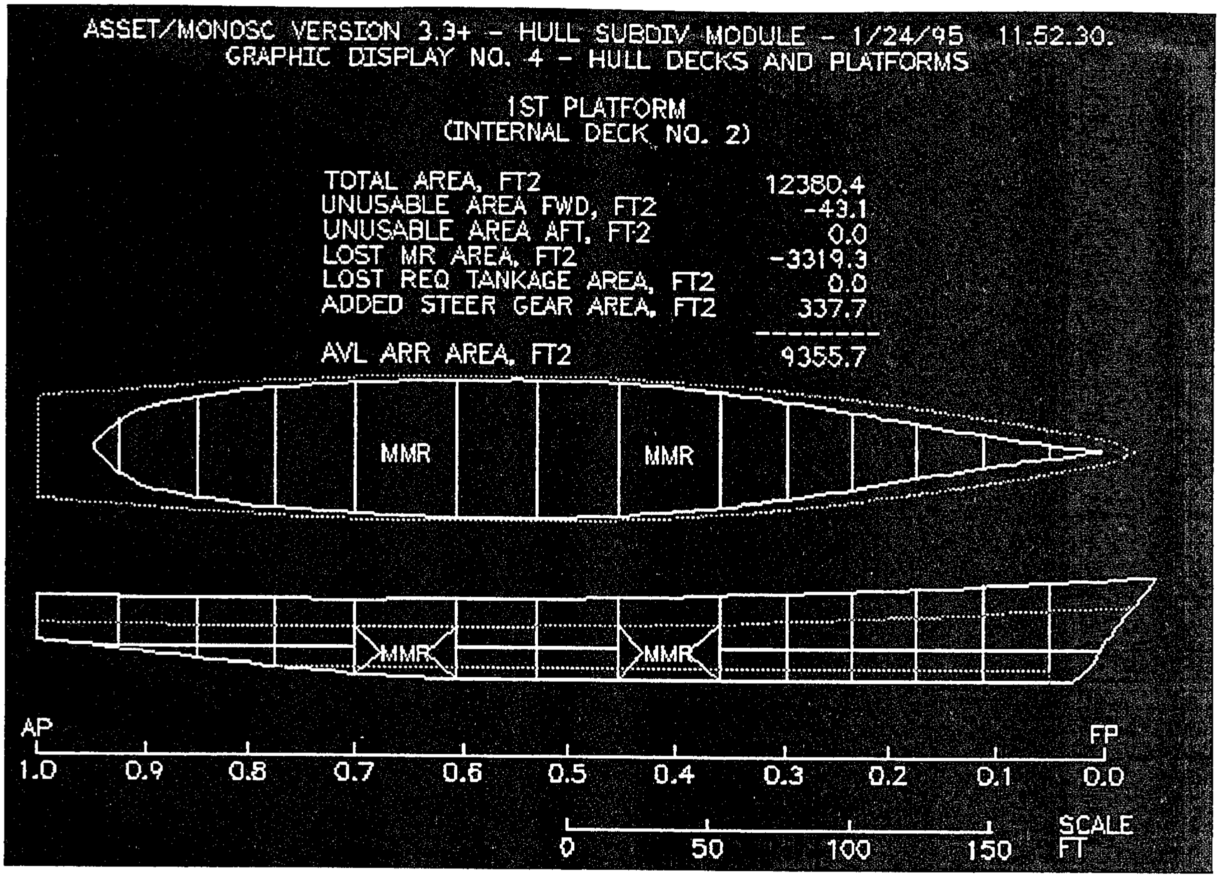

ASSET/MONOSC VERSION 3.3+ - HULL GEOM MODULE - 1/24/95 11.40.00.
GRAPHIC DISPLAY NO. 4 - DESIGN WATERLINE PLAN VIEW
AP
FP
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
50
100
150
SCALE
FT

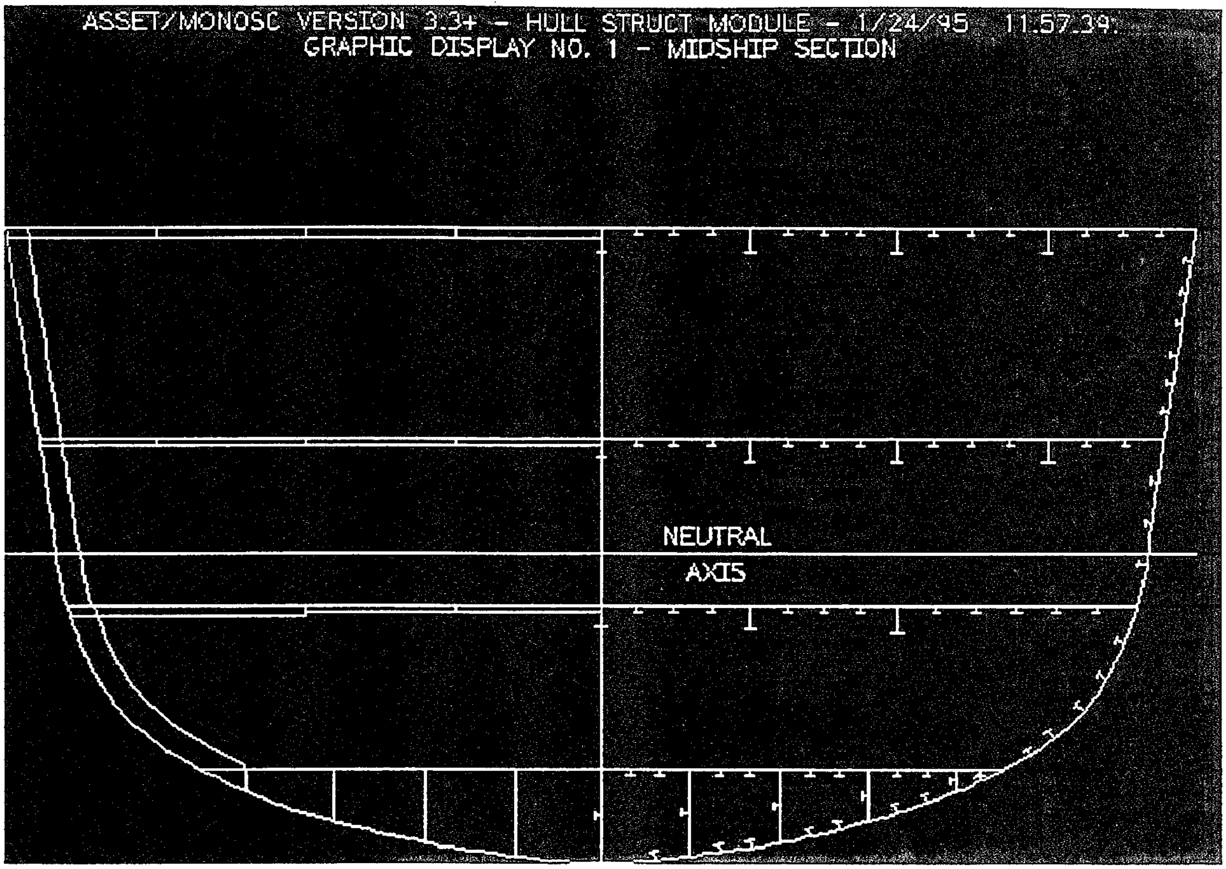

ASSET/MONOSC VERSION 3.3+ - HULL GEOM MODULE - 1/24/95 11.40.00.
GRAPHIC DISPLAY NO. 5 - HULL SECTIONAL AREA CURVE
SECTIONAL AREA FT2
700
600
500
400
300
200
100
0
1.0
AP
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
FP
FRACTION OF SHIP LBP FROM FP

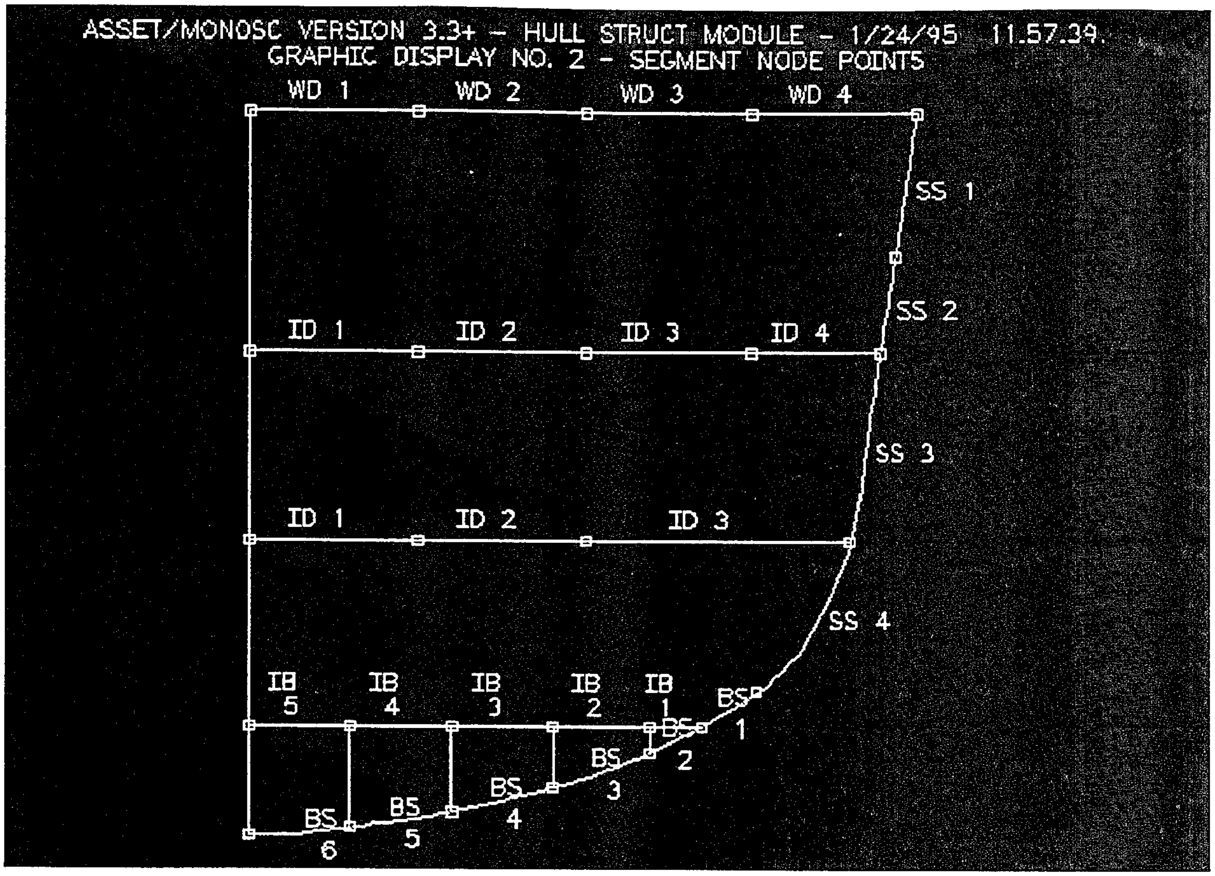

ASSET/MONOSC VERSION 3.3+ - HULL SUBDIV MODULE - 1/24/95 11.52.30.
GRAPHIC DISPLAY NO. 1 - MIDSHIP SECTION
0 5 10 15
SCALE
FT

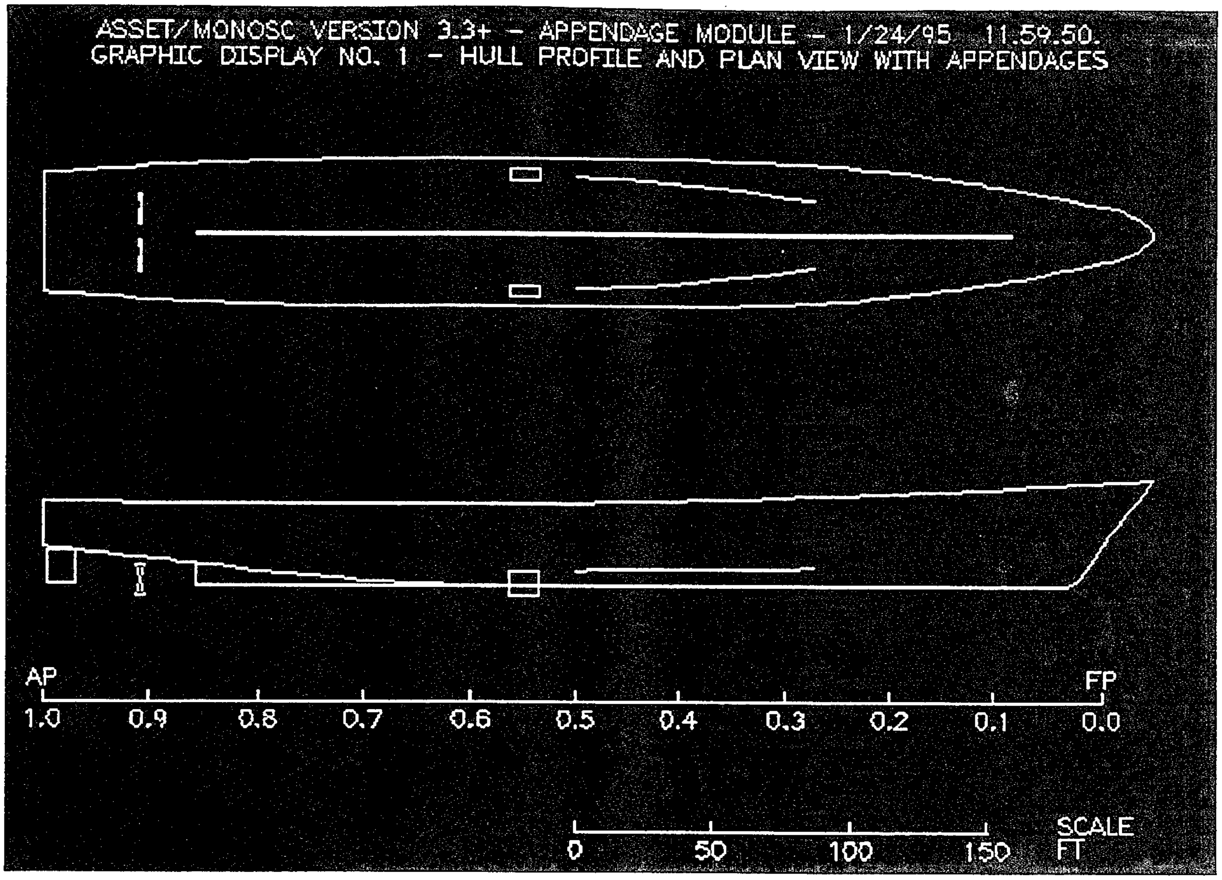

ASSET/MONOSC VERSION 3.3+ - HULL SUBDIV MODULE - 1/24/95 11.52.30.
GRAPHIC DISPLAY NO. 2 - HULL DECKS AND PLATFORMS
MAIN DECK
TOTAL AREA, FT2 18950.5
HULL VOLUME, FT3 388003.
MMR
MMR
AP
FP
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
50
100
150
SCALE
FT

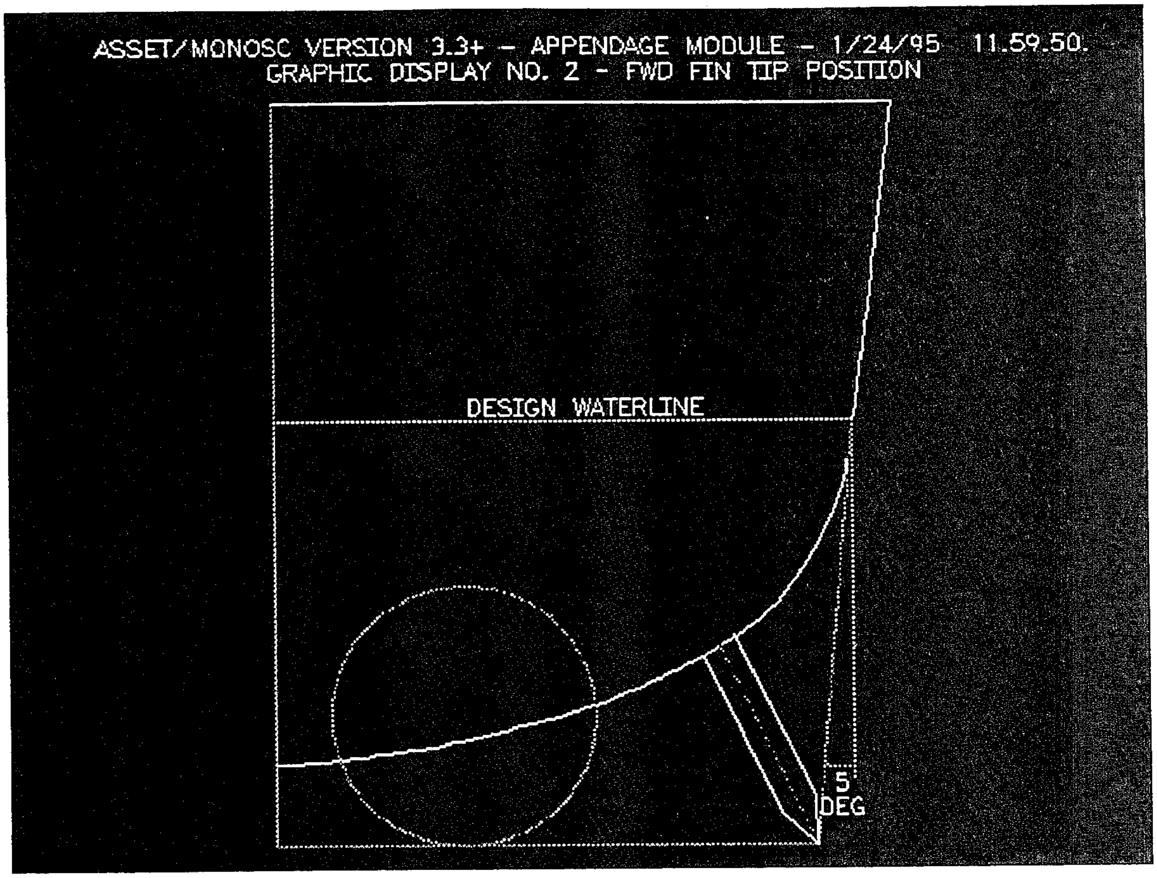

ASSET/MONOSC VERSION 3.3+ - HULL SUBDIV MODULE - 1/24/95 11.52.30.
GRAPHIC DISPLAY NO. 3 - HULL DECKS AND PLATFORMS
2ND DECK
(INTERNAL DECK NO. 1)
TOTAL AREA, FT2 15905.2
UNUSABLE AREA FWD, FT2 0.0
UNUSABLE AREA AFT, FT2 0.0
LOST MR AREA, FT2 0.0
LOST REQ TANKAGE AREA, FT2 0.0
AVL ARR AREA, FT2 15905.2
MMR
MMR
AP
FP
1.0 0.9 0.8 0.7 0.6 0.5 0.4 0.3 0.2 0.1 0.0
0 50 100 150
SCALE
FT

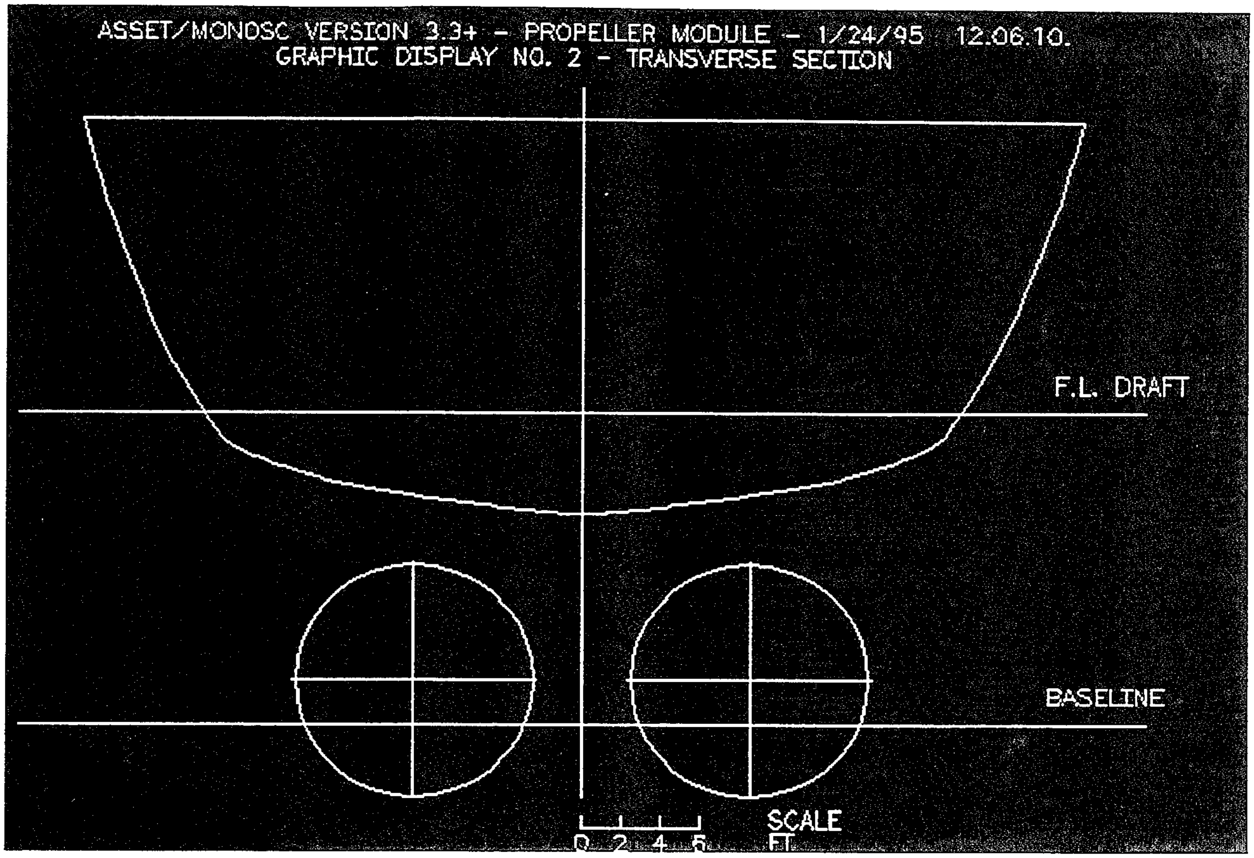

ASSET/MONOSC VERSION 3.3+ - HULL SUBDIV MODULE - 1/24/95 11.52.30.
GRAPHIC DISPLAY NO. 4 - HULL DECKS AND PLATFORMS
1ST PLATFORM
(INTERNAL DECK NO. 2)
TOTAL AREA, FT2 12380.4
UNUSABLE AREA FWD, FT2 -43.1
UNUSABLE AREA AFT, FT2 0.0
LOST MR AREA, FT2 -3319.3
LOST REQ TANKAGE AREA, FT2 0.0
ADDED STEER GEAR AREA, FT2 337.7
AVL ARR AREA, FT2 9355.7
MMR
MMR
MMR
MMR
AP
FP
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
50
100
150
SCALE
FT

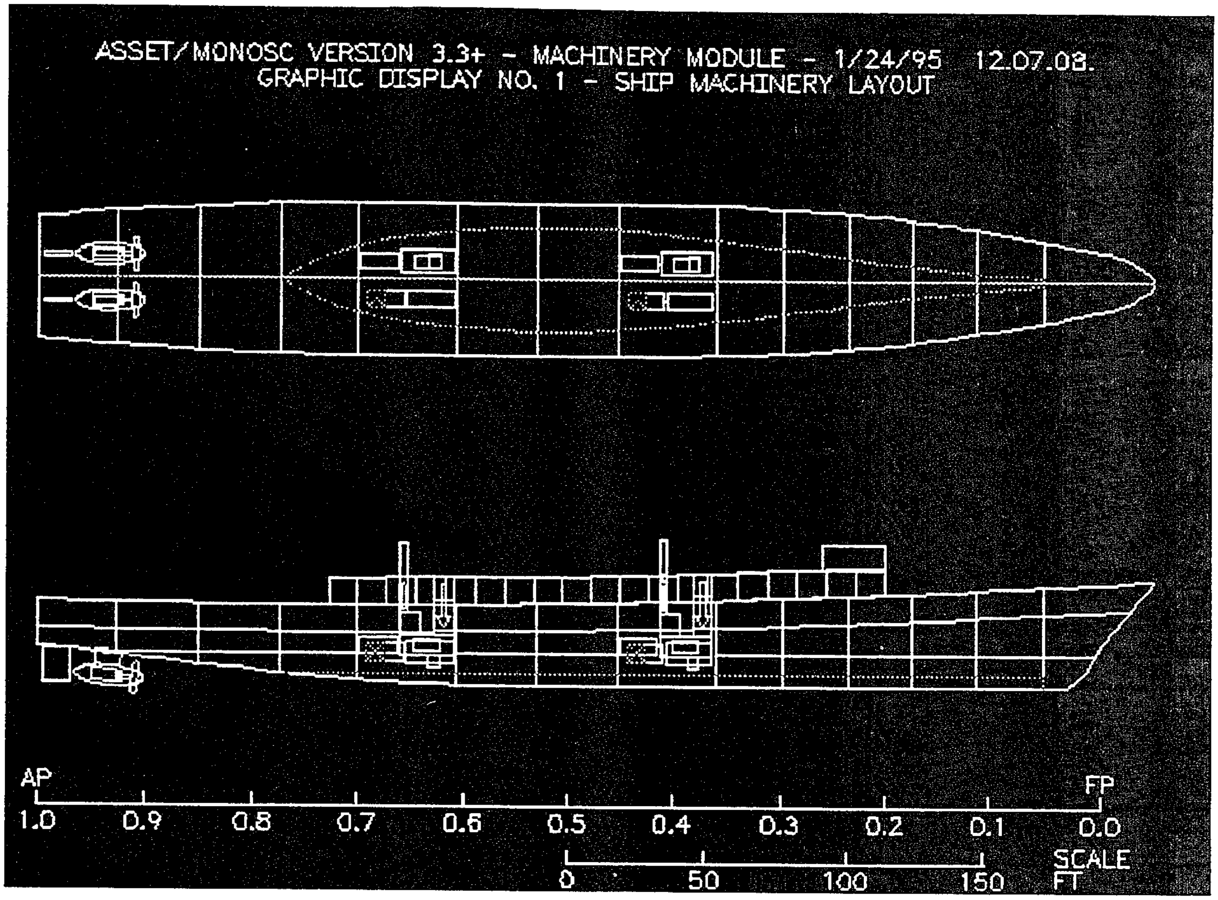

ASSET/MONOSC VERSION 3.3+ - HULL STRUCT MODULE - 1/24/95 11:57.39.
GRAPHIC DISPLAY NO. 1 - MIDSHIP SECTION
NEUTRAL
AXIS

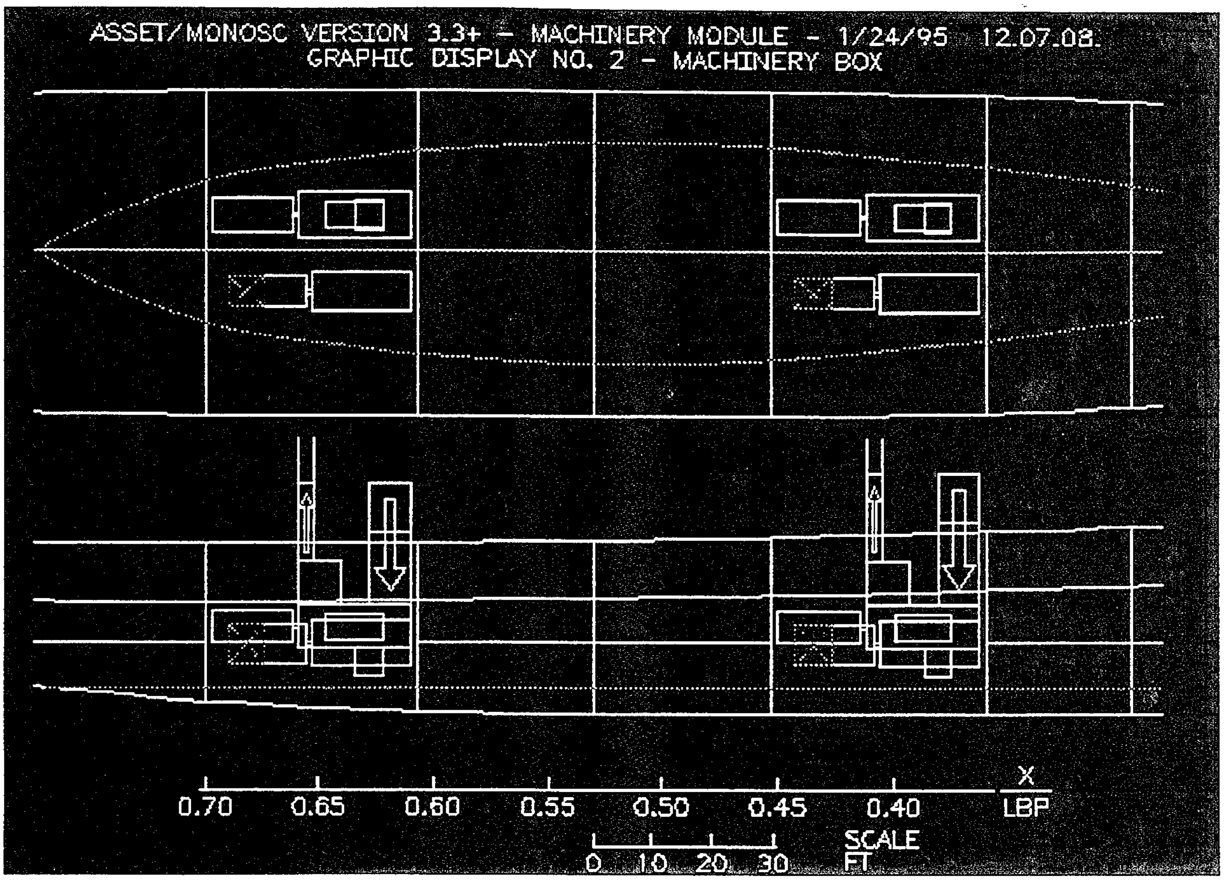

ASSET/MONOSC VERSION 3.3+ - HULL STRUCT MODULE - 1/24/95 11.57.39.
GRAPHIC DISPLAY NO. 2 - SEGMENT NODE POINTS
WD 1
WD 2
WD 3
WD 4
SS 1
SS 2
ID 1
ID 2
ID 3
ID 4
SS 3
ID 1
ID 2
ID 3
SS 4
IB 5
IB 4
IB 3
IB 2
IB 1
BS 1
BS 2
BS 3
BS 4
BS 5
BS 6

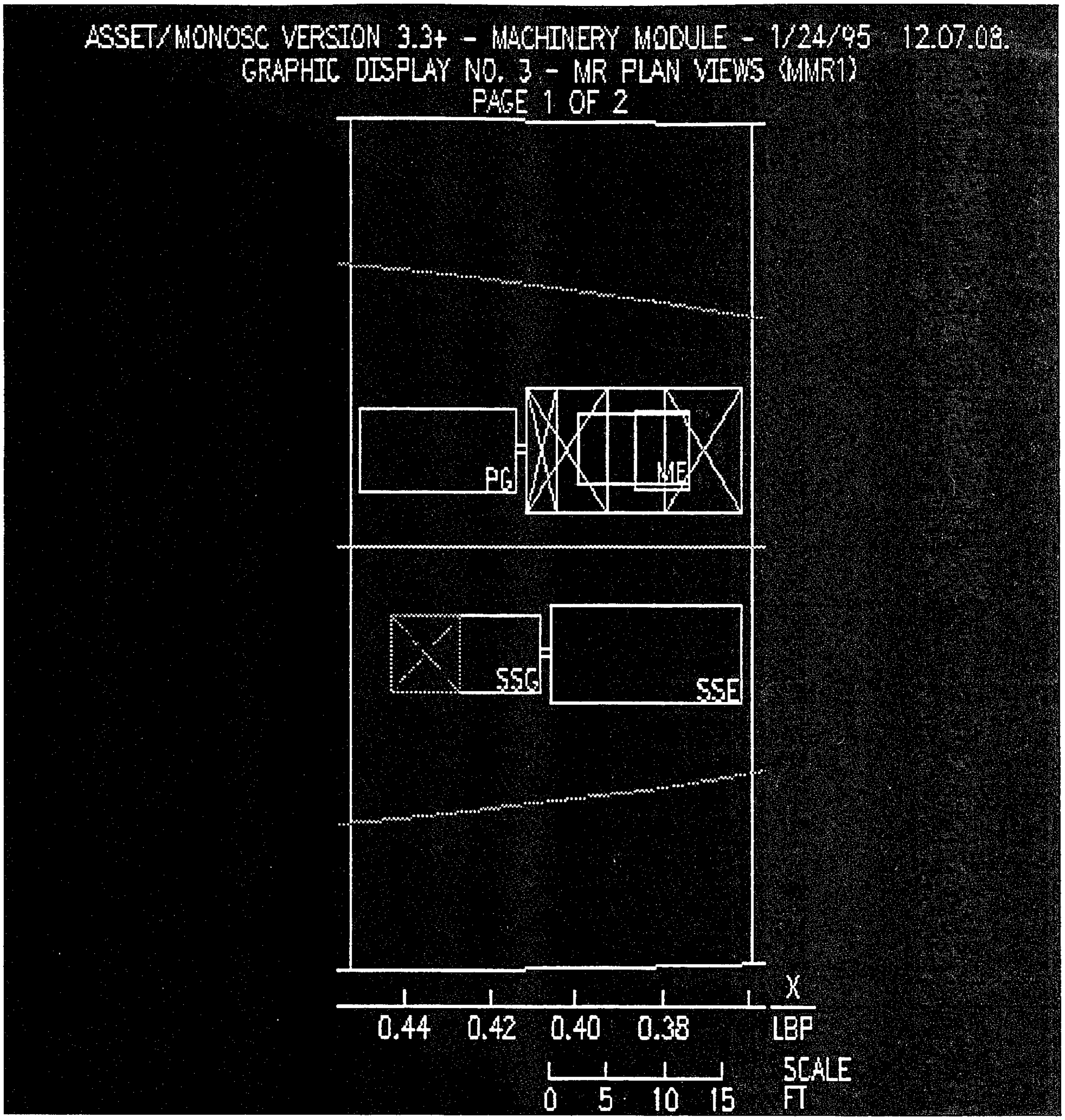

ASSET/MONOSC VERSION 3.3+ - APPENDAGE MODULE - 1/24/95 11.59.50.
GRAPHIC DISPLAY NO. 1 - HULL PROFILE AND PLAN VIEW WITH APPENDAGES
AP
FP
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
50
100
150
SCALE
FT

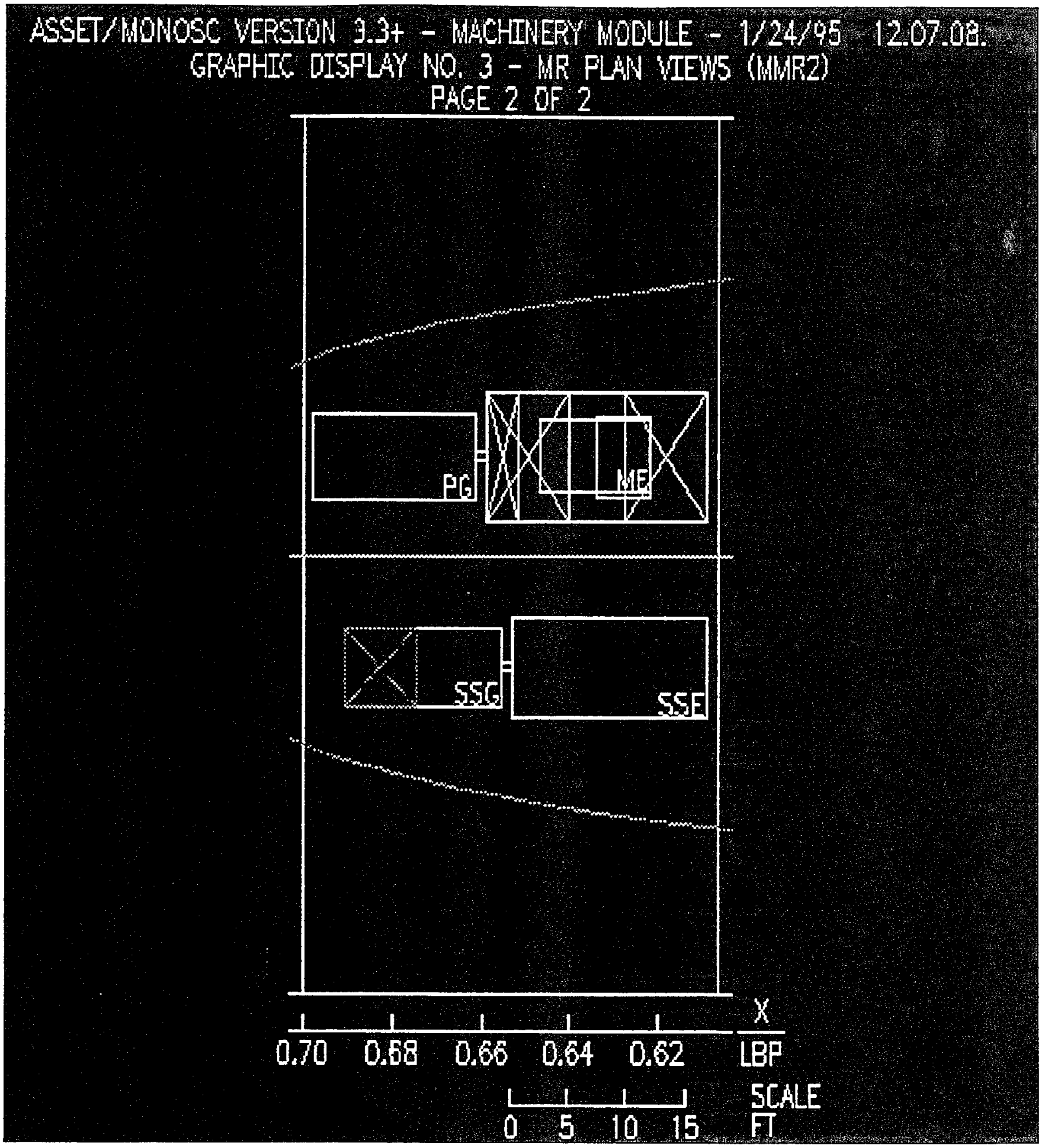

ASSET/MONOSC VERSION 3.3+ - APPENDAGE MODULE - 1/24/95 11.59.50.
GRAPHIC DISPLAY NO. 2 - FWD FIN TIP POSITION
DESIGN WATERLINE
5
DEG

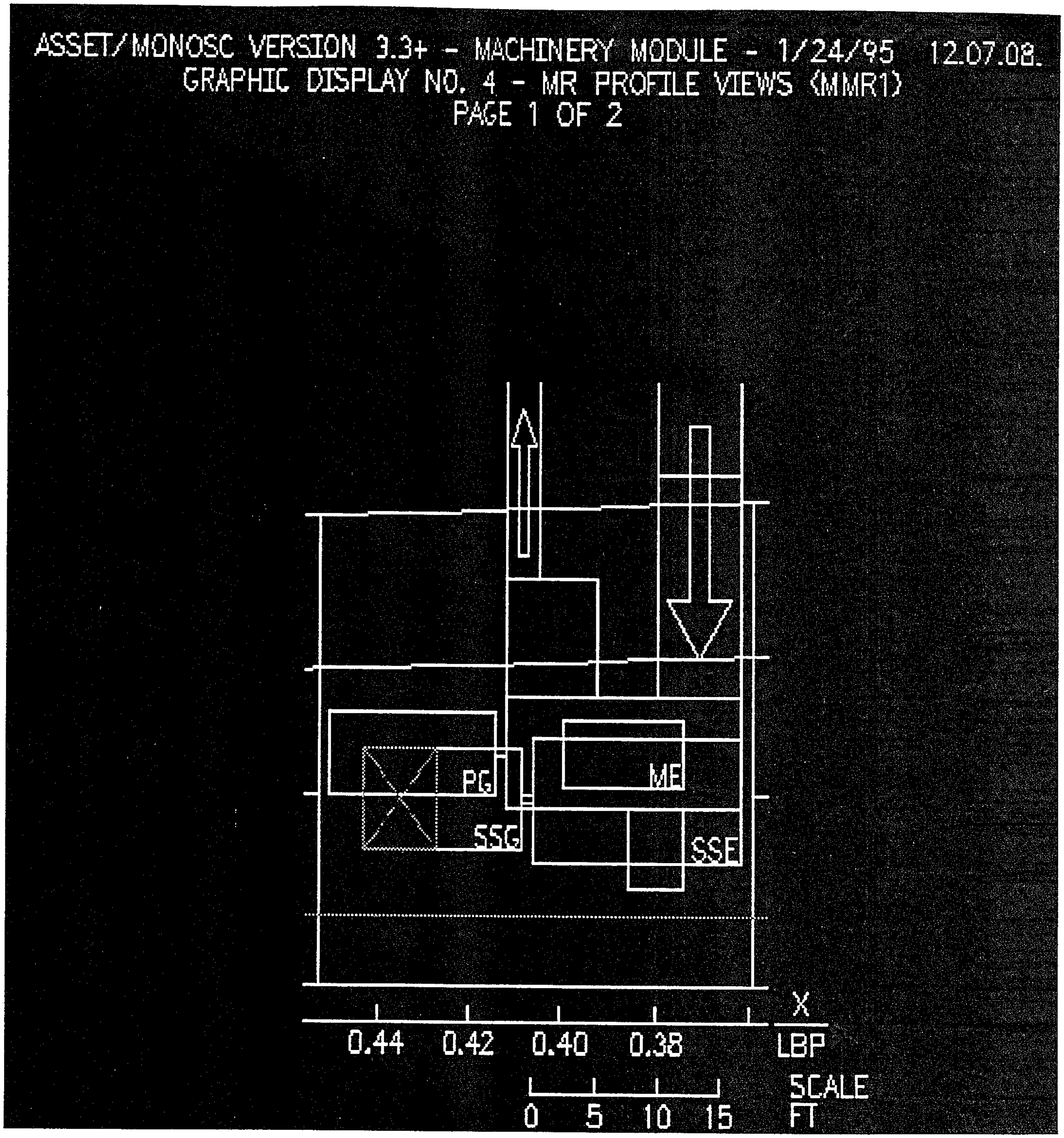

ASSET/MONOSC VERSION 3.3+ - PROPELLER MODULE - 1/24/95 12.06.10.
GRAPHIC DISPLAY NO. 2 - TRANSVERSE SECTION
F.L. DRAFT
BASELINE
SCALE
FT
0 2 4 6

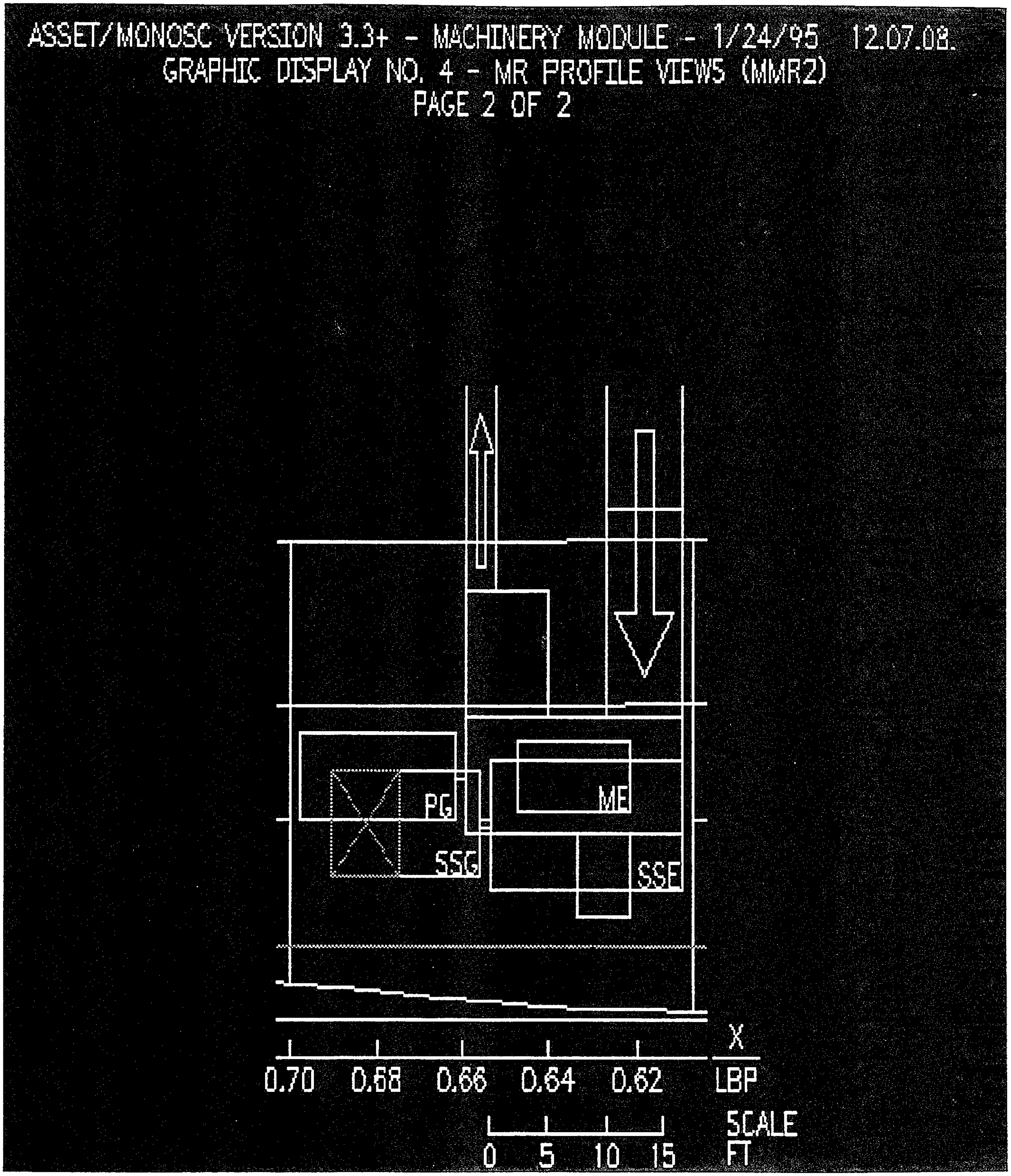

ASSET/MONOSC VERSION 3.3+ - MACHINERY MODULE - 1/24/95 12.07.08.
GRAPHIC DISPLAY NO. 1 - SHIP MACHINERY LAYOUT
AP
FP
1.0 0.9 0.8 0.7 0.6 0.5 0.4 0.3 0.2 0.1 0.0
0 50 100 150
SCALE
FT

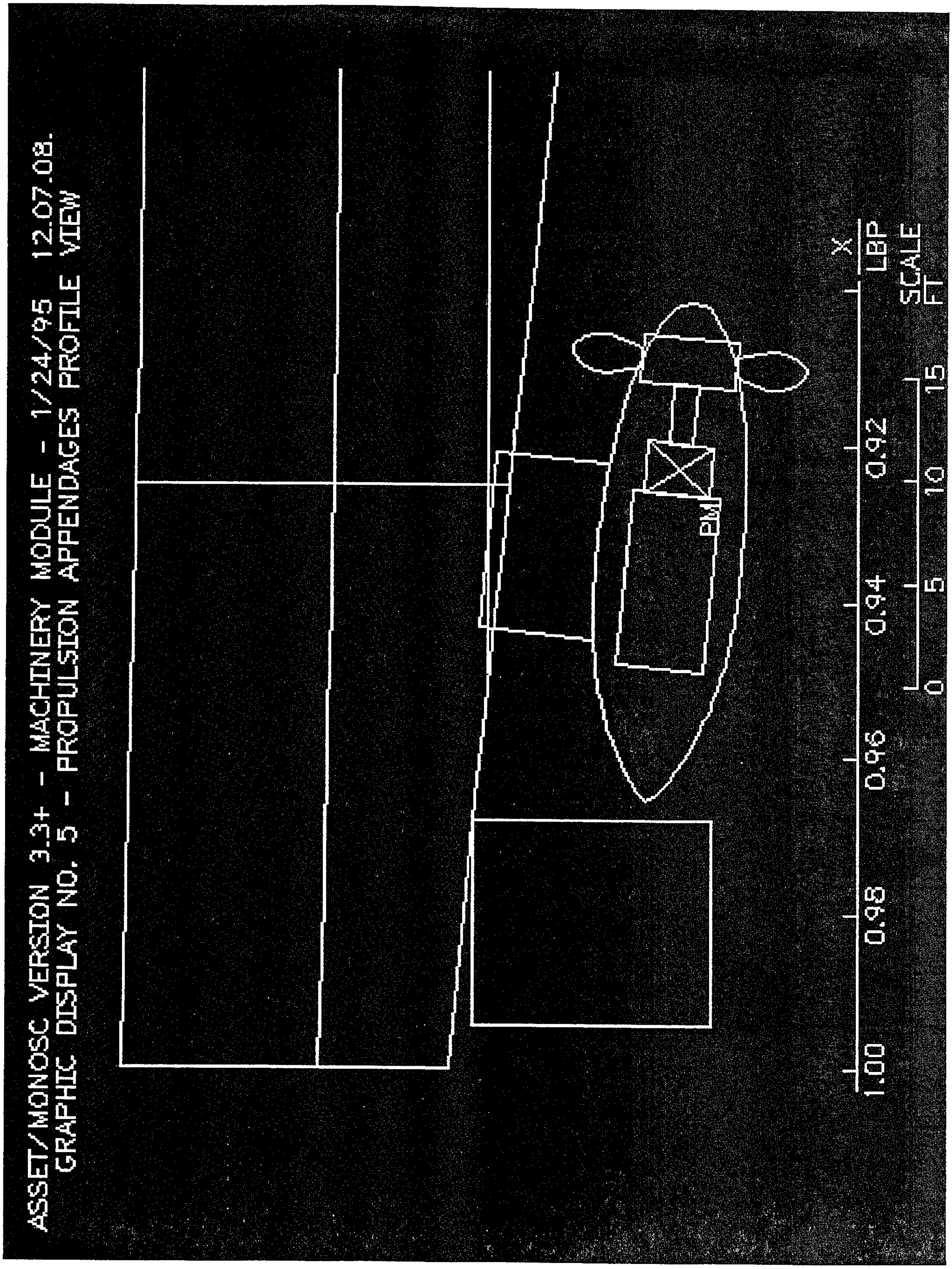

ASSET/MONOSC VERSION 3.3+ - MACHINERY MODULE - 1/24/95 12.07.08.
GRAPHIC DISPLAY NO. 2 - MACHINERY BOX
0.70
0.65
0.60
0.55
0.50
0.45
0.40
X
LBP
SCALE
FT
0 10 20 30


ASSET/MONOSC VERSION 3.3+ - MACHINERY MODULE - 1/24/95 12.07.08.
GRAPHIC DISPLAY NO. 3 - MR PLAN VIEWS (MMR1)
PAGE 1 OF 2
PG
ME
SSG
SSE
X
0.44 0.42 0.40 0.38
LBP
SCALE
0 5 10 15
FT


ASSET/MONOSC VERSION 3.3+ - MACHINERY MODULE - 1/24/95 12.07.08.
GRAPHIC DISPLAY NO. 3 - MR PLAN VIEWS (MMR2)
PAGE 2 OF 2
PG
ME
SSG
SSE
X
LBP
0.70 0.68 0.66 0.64 0.62
SCALE
FT
0 5 10 15

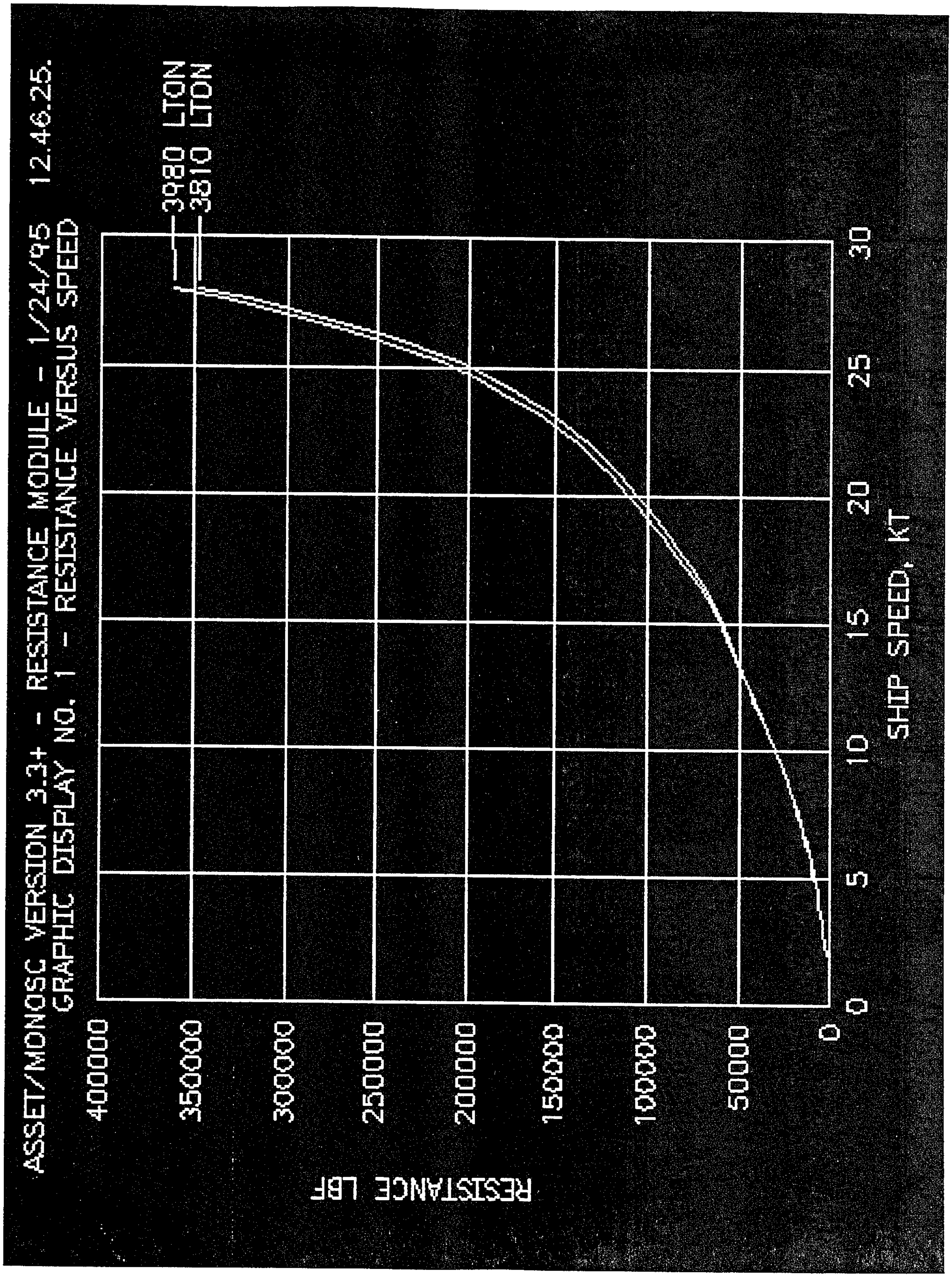

ASSET/MONOSC VERSION 3.3+ - MACHINERY MODULE - 1/24/95 12.07.08.
GRAPHIC DISPLAY NO. 4 - MR PROFILE VIEWS (MMR1)
PAGE 1 OF 2
PG
SSG
ME
SSE
X
LBP
0.44
0.42
0.40
0.38
SCALE
FT
0
5
10
15

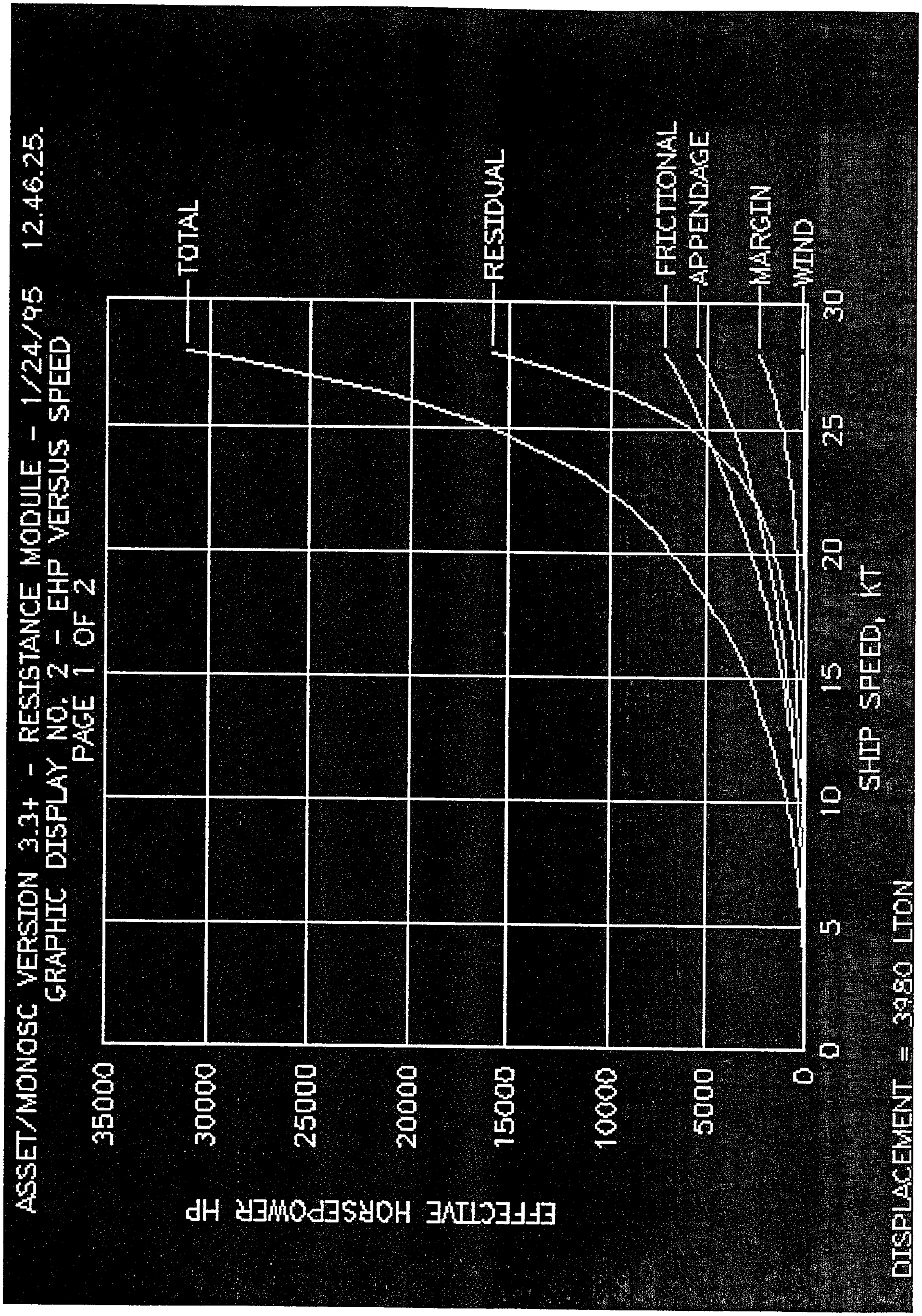

ASSET/MONOSC VERSION 3.3+ - MACHINERY MODULE - 1/24/95 12.07.08.
GRAPHIC DISPLAY NO. 4 - MR PROFILE VIEWS (MMR2)
PAGE 2 OF 2
PG
ME
SSG
SSE
X
LBP
0.70
0.68
0.66
0.64
0.62
SCALE
FT
0
5
10
15

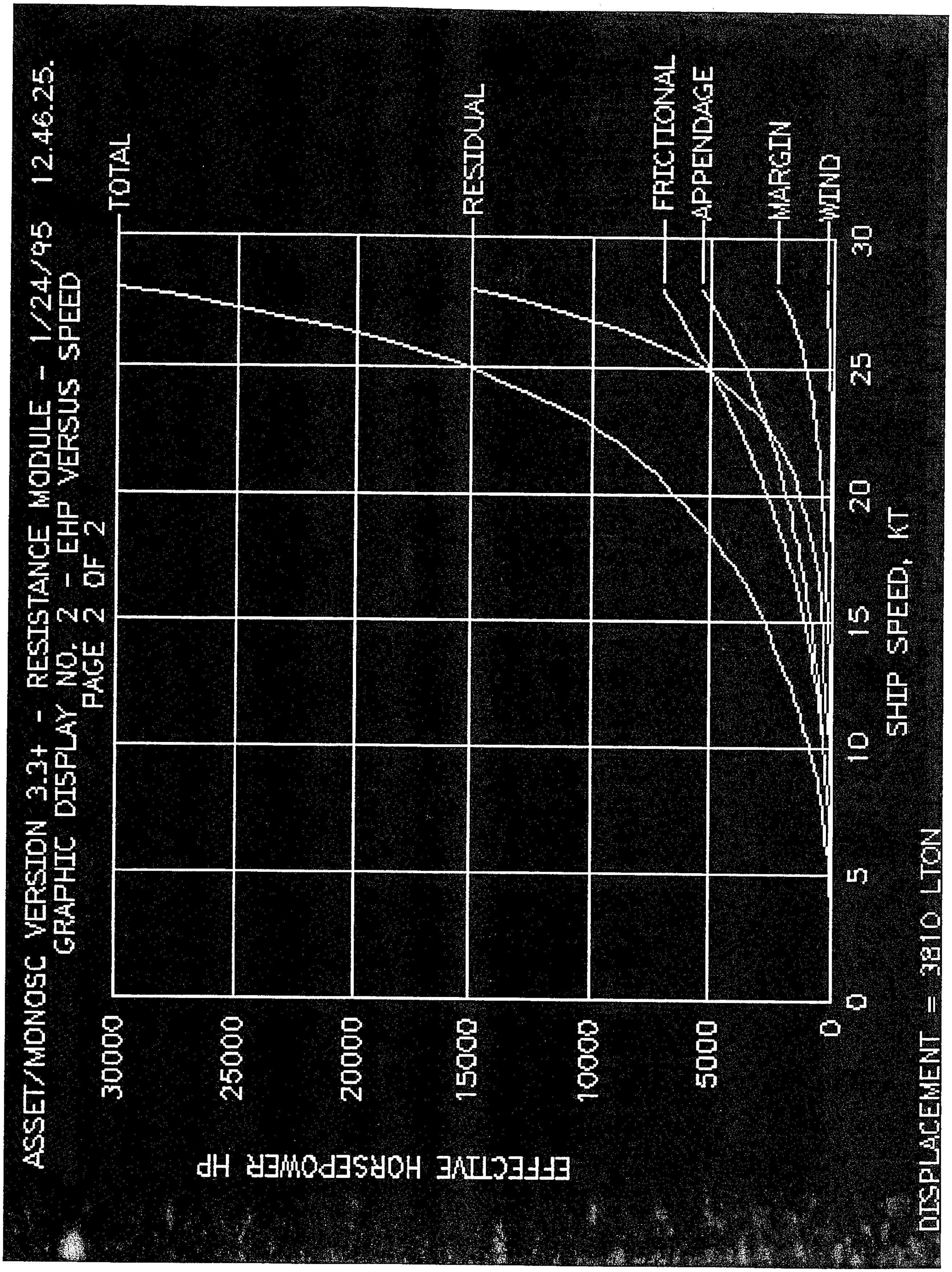

ASSET/MONOSC VERSION 3.3+ - MACHINERY MODULE - 1/24/95 12.07.08.
GRAPHIC DISPLAY NO. 5 - PROPULSION APPENDAGES PROFILE VIEW
PM
1.00
0.98
0.96
0.94
0.92
X
LBP
0
5
10
15
SCALE
FT

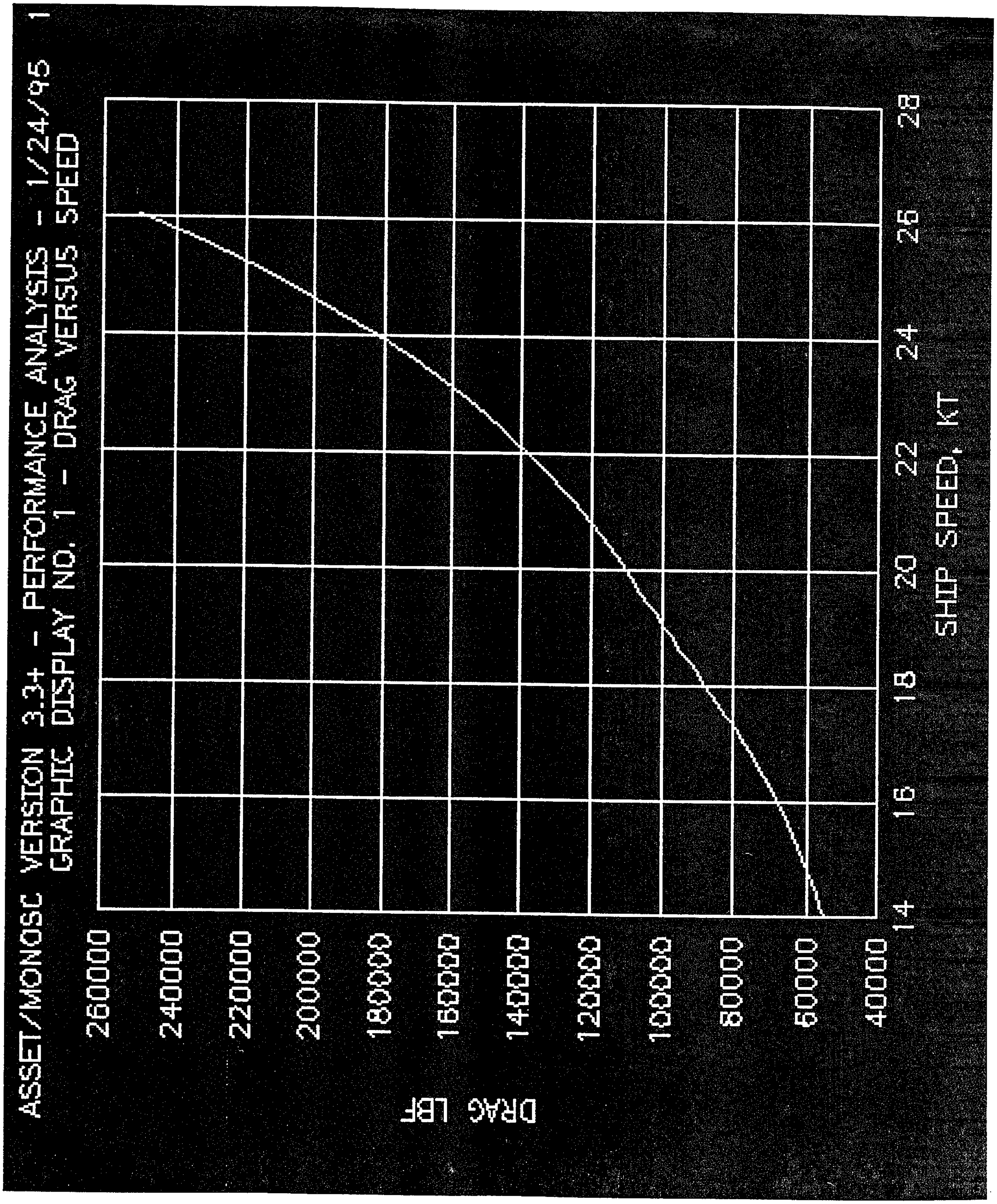
# SECTION 2

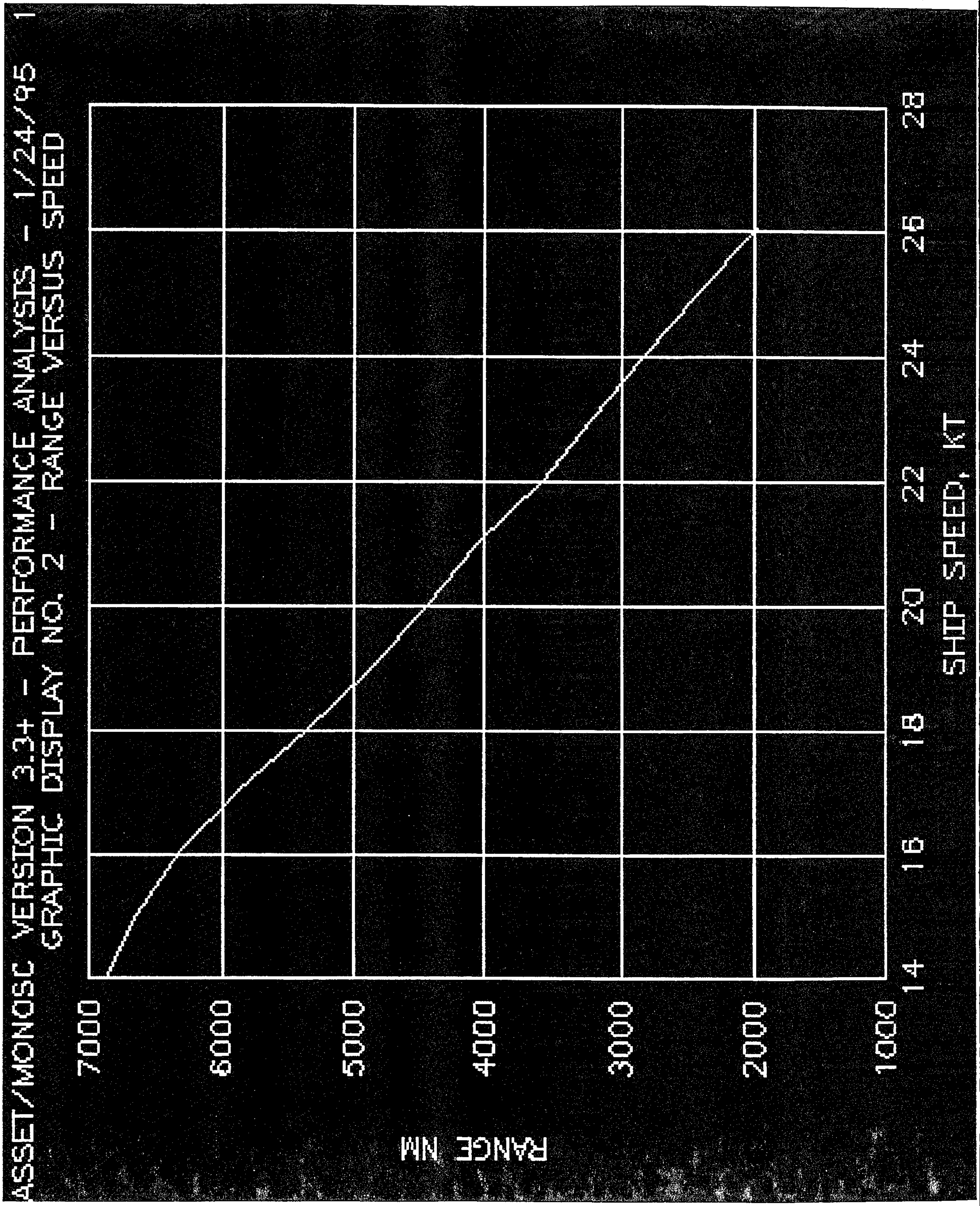
# NAVY VARIANT SPECIFIC REPORTS

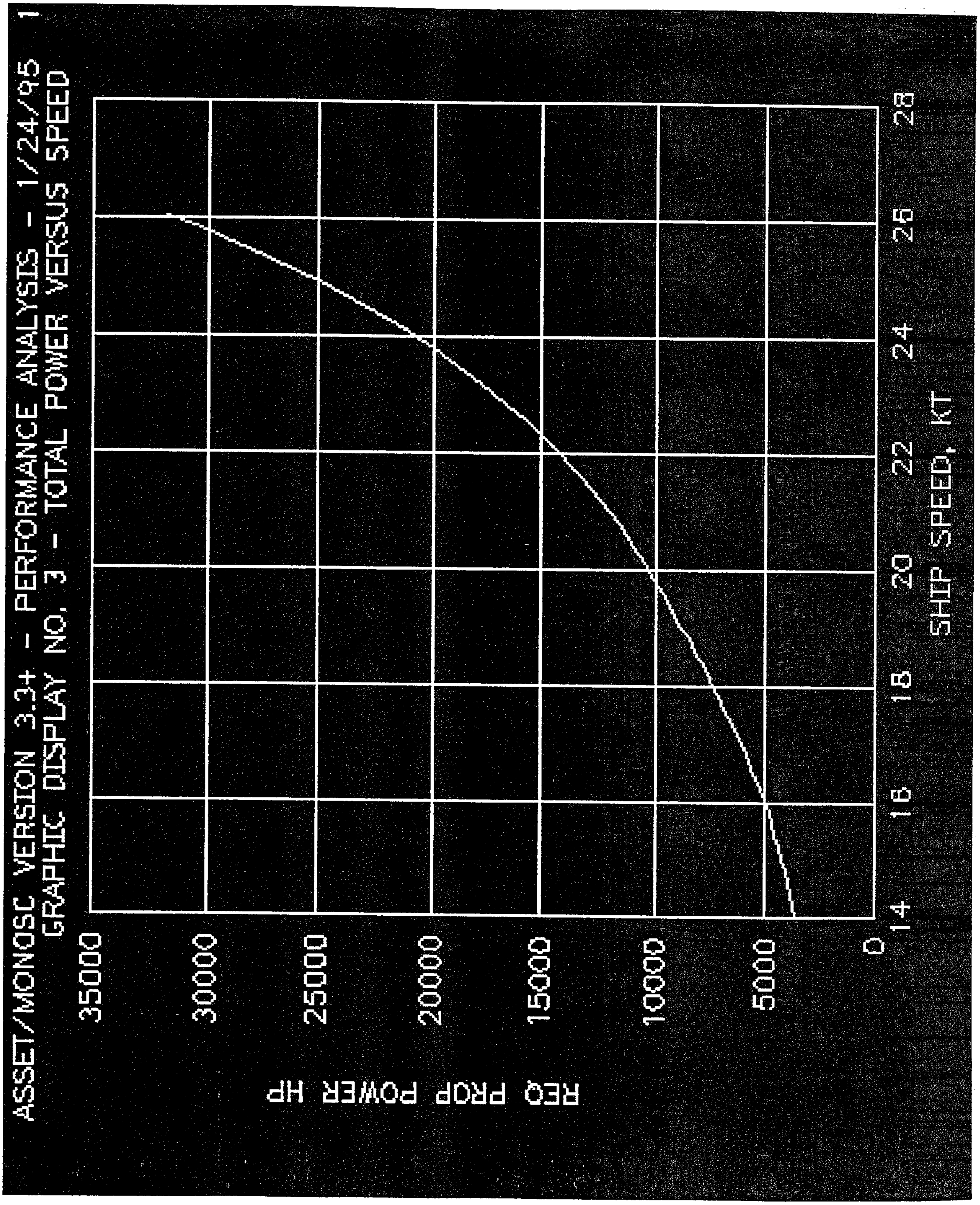

ASSET/MONOSC VERSION 3.3+ - RESISTANCE MODULE - 1/24/95 12.46.25.
GRAPHIC DISPLAY NO. 1 - RESISTANCE VERSUS SPEED
3980 LTON
3810 LTON
RESISTANCE LBF
400000
350000
300000
250000
200000
150000
100000
50000
0
0
5
10
15
20
25
30
SHIP SPEED, KT

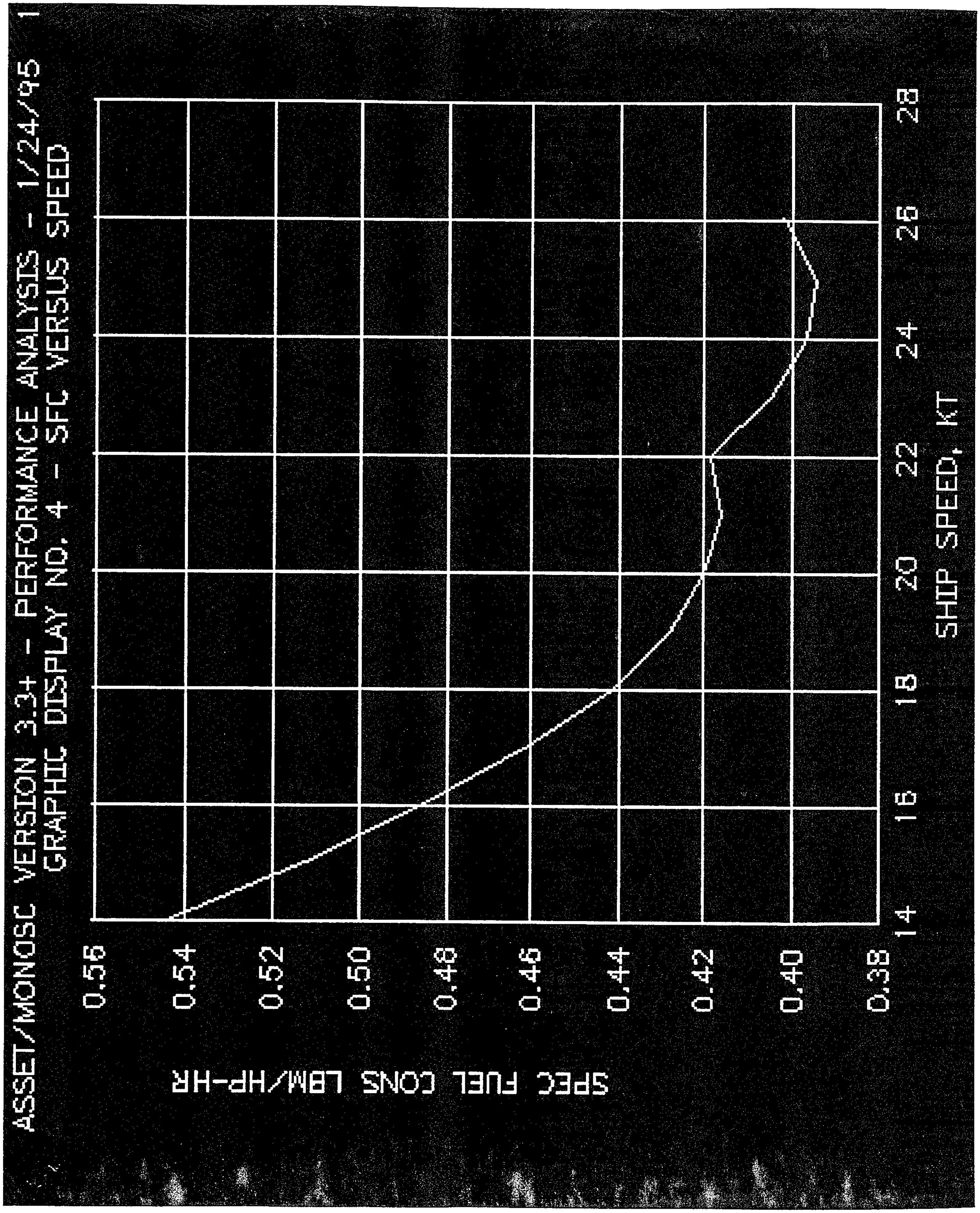

ASSET/MONOSC VERSION 3.3+ - RESISTANCE MODULE - 1/24/95 12.46.25.
GRAPHIC DISPLAY NO. 2 - EHP VERSUS SPEED
PAGE 1 OF 2
EFFECTIVE HORSEPOWER HP
35000
30000
25000
20000
15000
10000
5000
0
0
5
10
15
20
25
30
SHIP SPEED, KT
TOTAL
RESIDUAL
FRICTIONAL
APPENDAGE
MARGIN
WIND
DISPLACEMENT = 3980 LTON

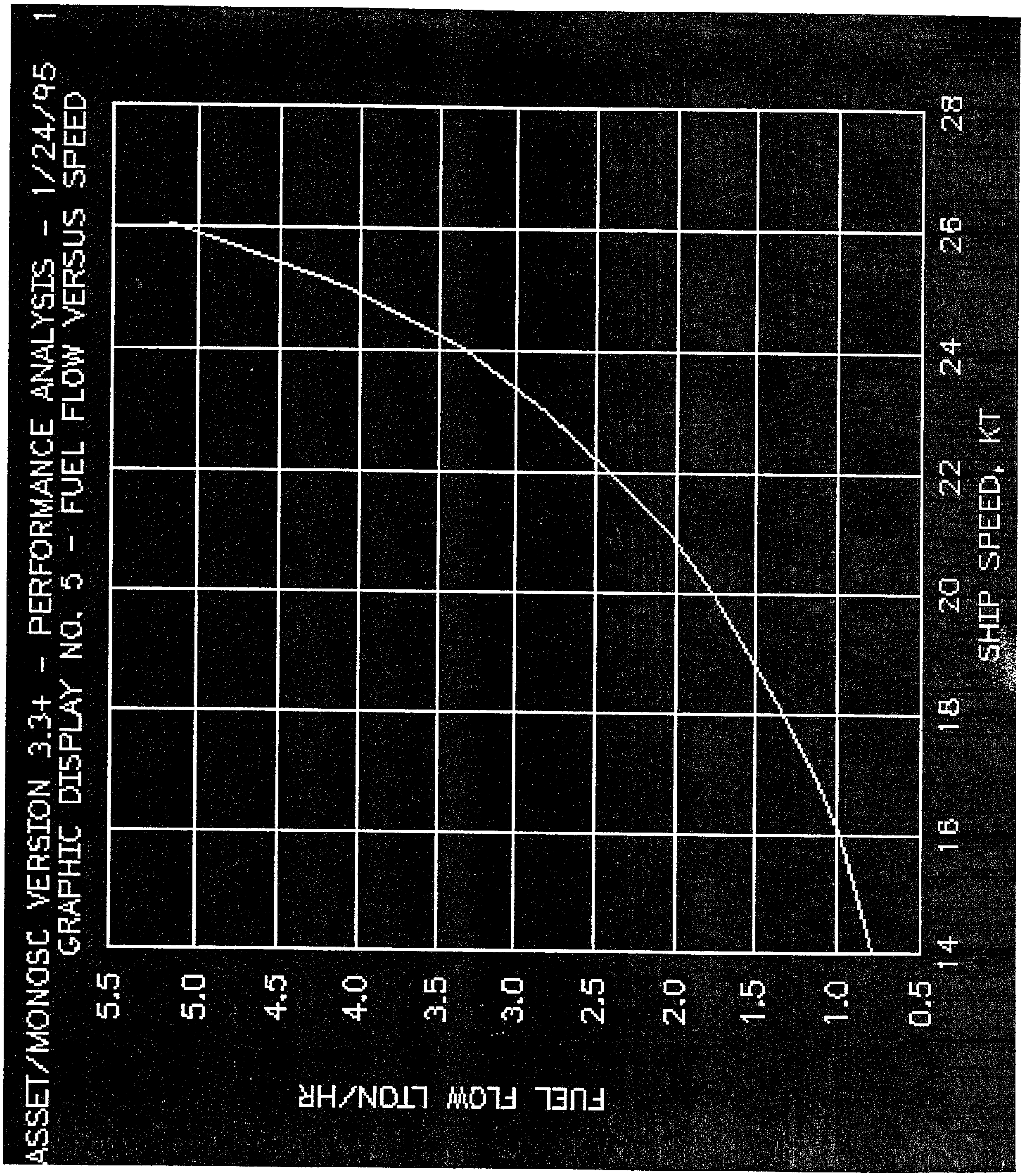

ASSET/MONOSC VERSION 3.3+ - RESISTANCE MODULE - 1/24/95 12.46.25.
GRAPHIC DISPLAY NO. 2 - EHP VERSUS SPEED
PAGE 2 OF 2
EFFECTIVE HORSEPOWER HP
30000
25000
20000
15000
10000
5000
0
0
5
10
15
20
25
30
SHIP SPEED, KT
TOTAL
RESIDUAL
FRICTIONAL
APPENDAGE
MARGIN
WIND
DISPLACEMENT = 3810 LTON

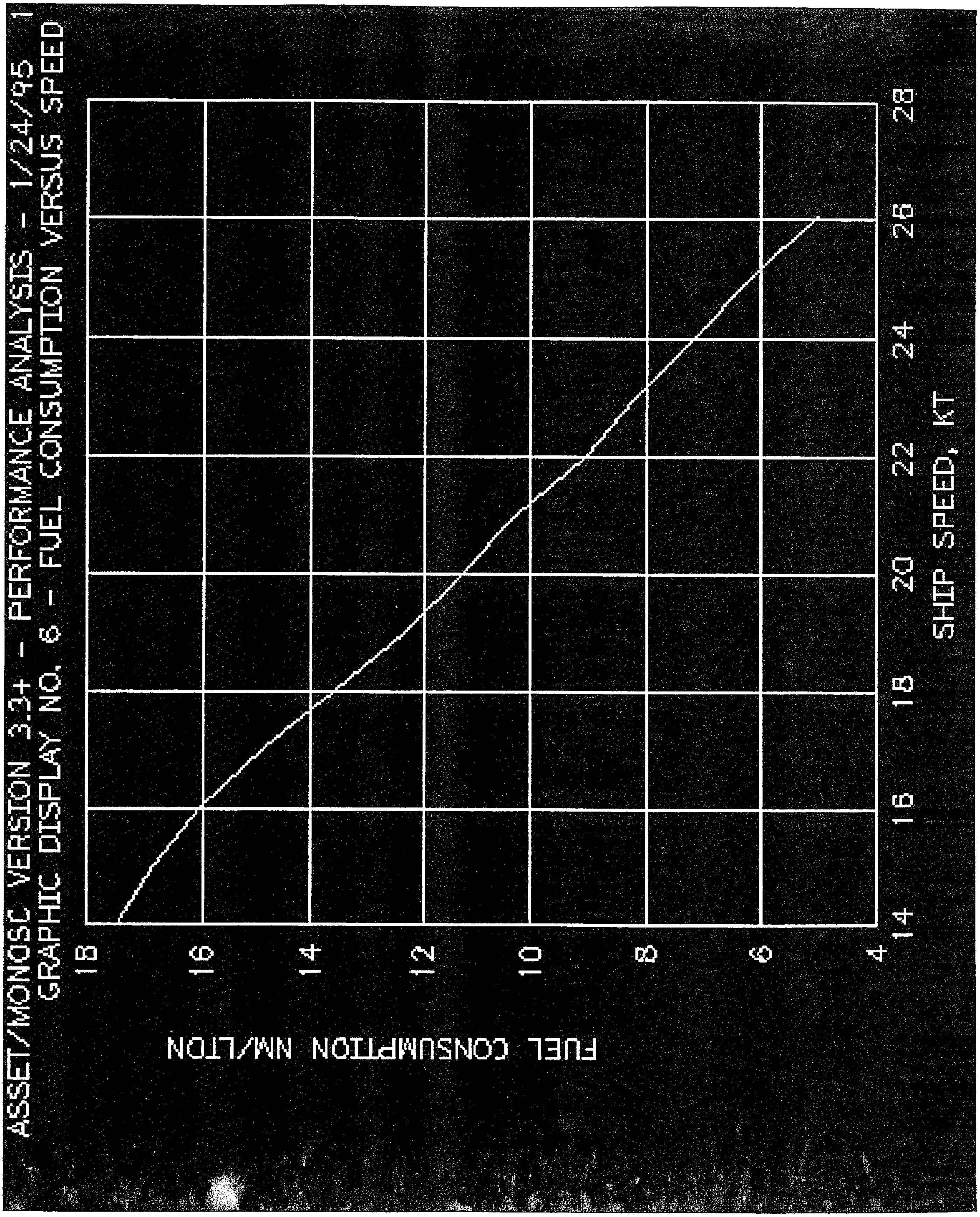

ASSET/MONOSC VERSION 3.3+ - PERFORMANCE ANALYSIS - 1/24/95 1
GRAPHIC DISPLAY NO. 1 - DRAG VERSUS SPEED
DRAG LBF
260000
240000
220000
200000
180000
160000
140000
120000
100000
80000
60000
40000
SHIP SPEED, KT
14
16
18
20
22
24
26
28

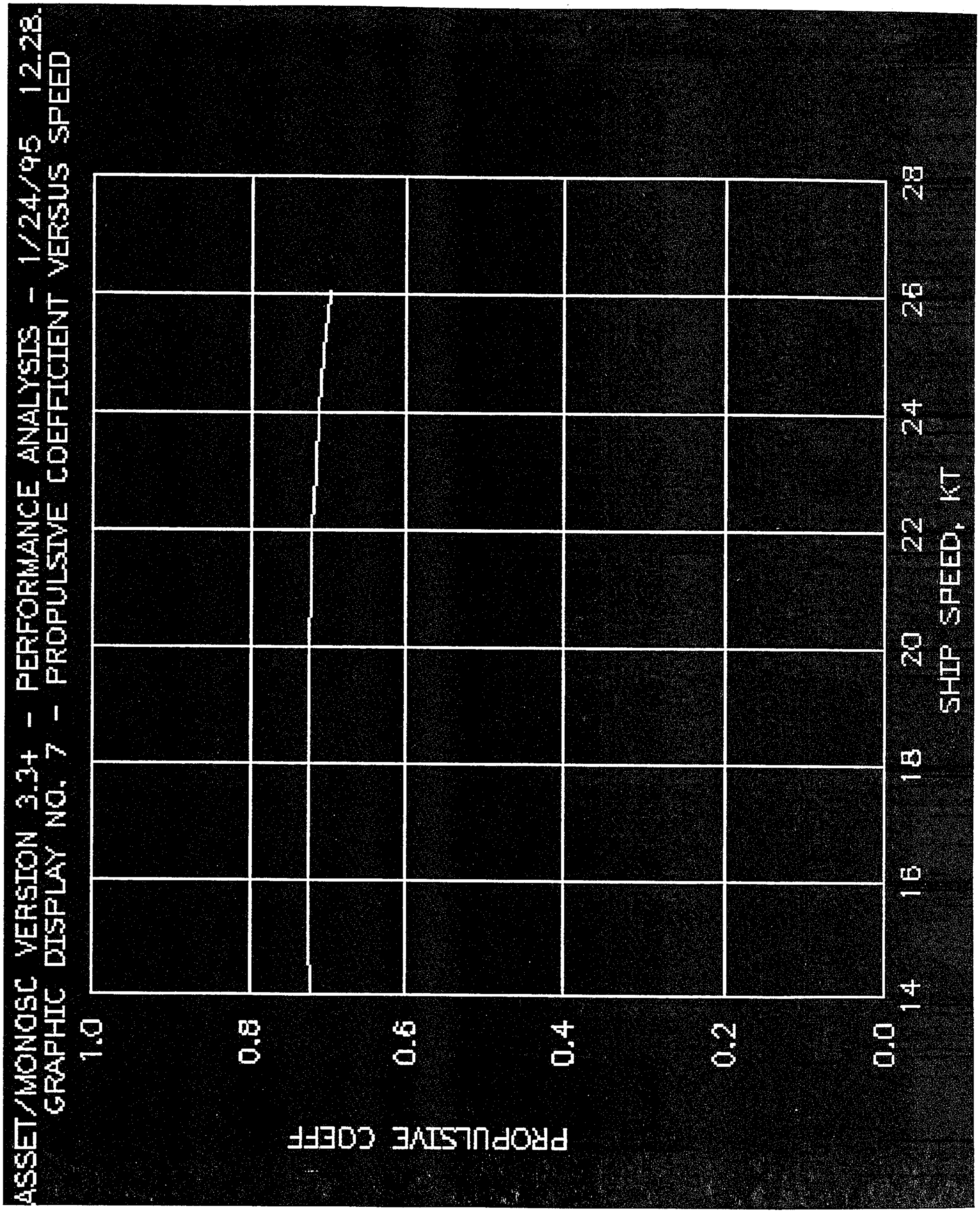

ASSET/MONOSC VERSION 3.3+ - PERFORMANCE ANALYSIS - 1/24/95 1
GRAPHIC DISPLAY NO. 2 - RANGE VERSUS SPEED
RANGE NM
7000
6000
5000
4000
3000
2000
1000
14
16
18
20
22
24
26
28
SHIP SPEED, KT

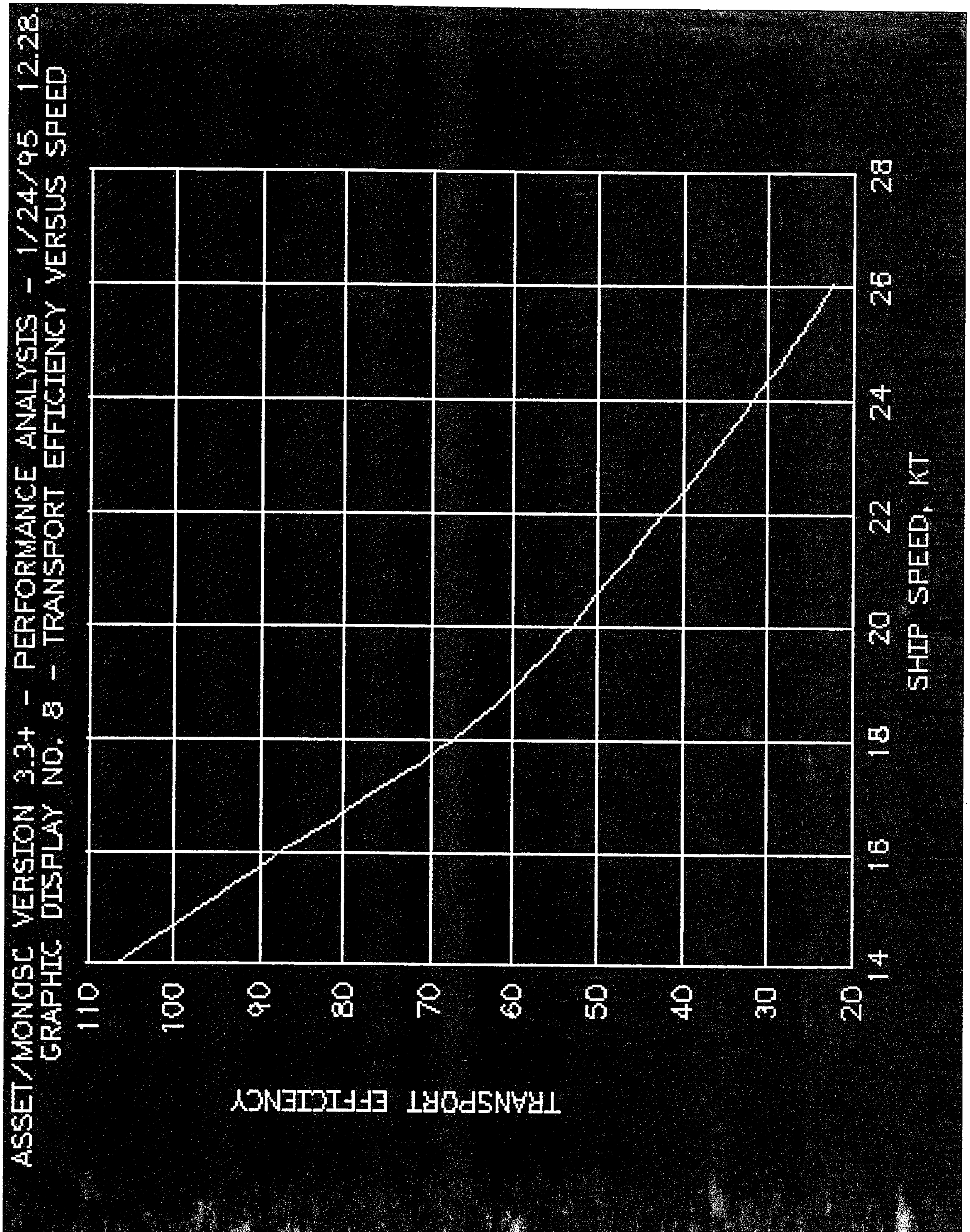

ASSET/MONOSC VERSION 3.3+ - PERFORMANCE ANALYSIS - 1/24/95 1
GRAPHIC DISPLAY NO. 3 - TOTAL POWER VERSUS SPEED
REQ PROP POWER HP
35000
30000
25000
20000
15000
10000
5000
0
14
16
18
20
22
24
26
28
SHIP SPEED, KT

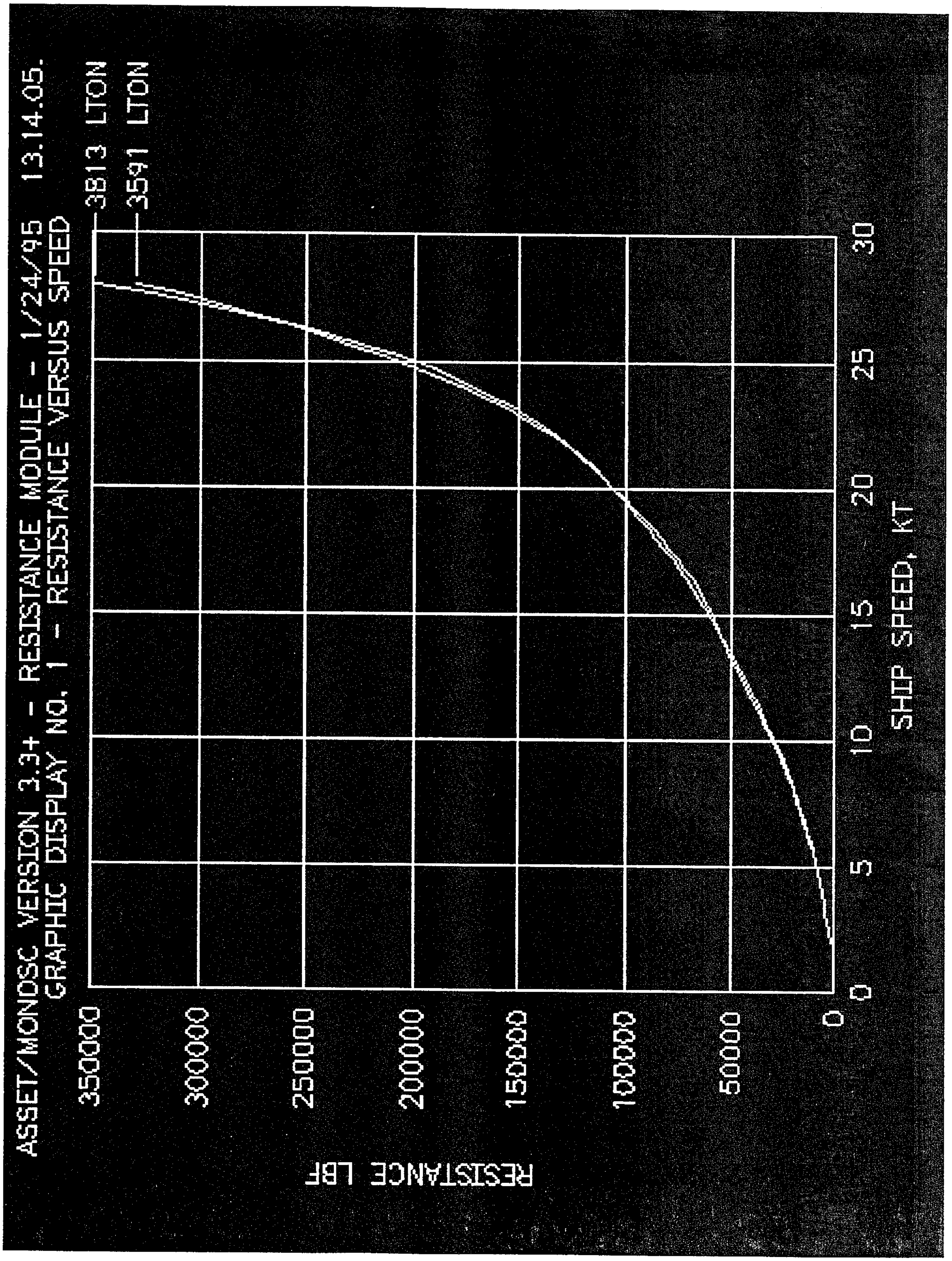

ASSET/MONOSC VERSION 3.3+ - PERFORMANCE ANALYSIS - 1/24/95 1
GRAPHIC DISPLAY NO. 4 - SFC VERSUS SPEED
SPEC FUEL CONS LBM/HP-HR
0.56
0.54
0.52
0.50
0.48
0.46
0.44
0.42
0.40
0.38
14
16
18
20
22
24
26
28
SHIP SPEED, KT


ASSET/MONOSC VERSION 3.3+ - PERFORMANCE ANALYSIS - 1/24/95 1
GRAPHIC DISPLAY NO. 5 - FUEL FLOW VERSUS SPEED
FUEL FLOW LTON/HR
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
14
16
18
20
22
24
26
28
SHIP SPEED, KT


ASSET/MONOSC VERSION 3.3+ - PERFORMANCE ANALYSIS - 1/24/95 1
GRAPHIC DISPLAY NO. 6 - FUEL CONSUMPTION VERSUS SPEED
FUEL CONSUMPTION NM/LTON
SHIP SPEED, KT
18
16
14
12
10
8
6
4
14
16
18
20
22
24
26
28

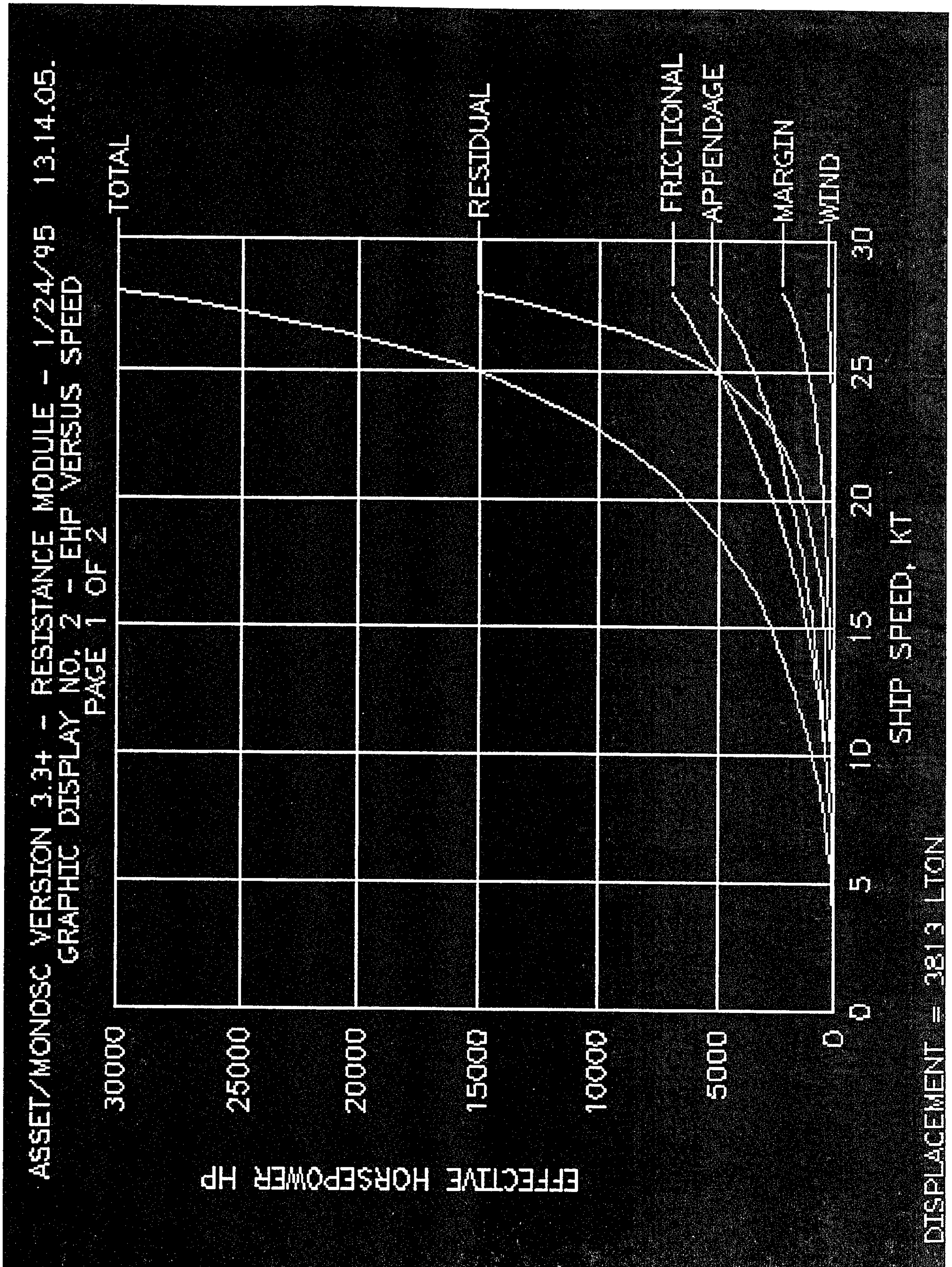

ASSET/MONOSC VERSION 3.3+ - PERFORMANCE ANALYSIS - 1/24/95 12.28.
GRAPHIC DISPLAY NO. 7 - PROPULSIVE COEFFICIENT VERSUS SPEED
PROPULSIVE COEFF
1.0
0.8
0.6
0.4
0.2
0.0
14
16
18
20
22
24
26
28
SHIP SPEED, KT

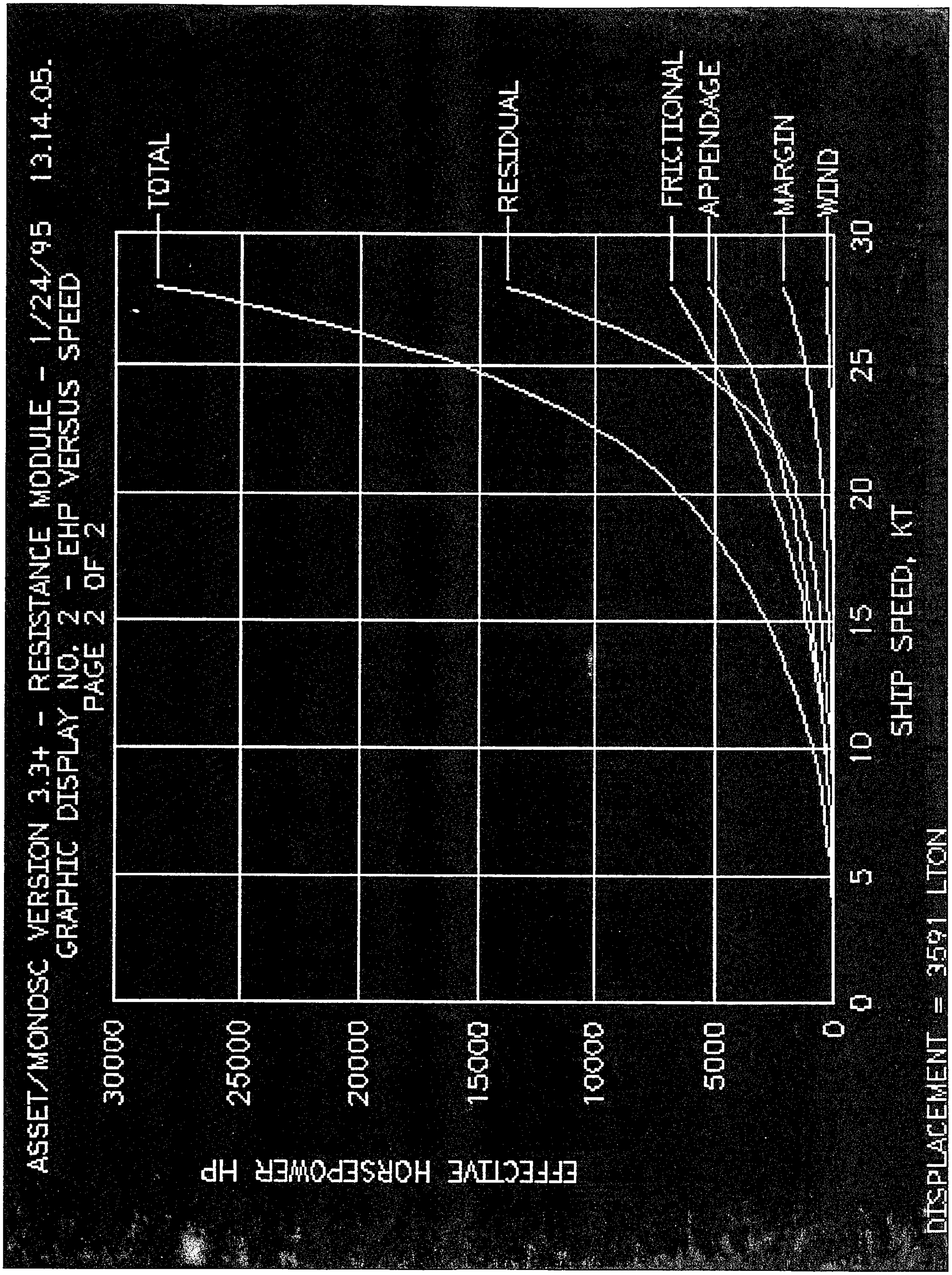

ASSET/MONOSC VERSION 3.3+ - PERFORMANCE ANALYSIS - 1/24/95 12.28.
GRAPHIC DISPLAY NO. 8 - TRANSPORT EFFICIENCY VERSUS SPEED
TRANSPORT EFFICIENCY
110
100
90
80
70
60
50
40
30
20
14
16
18
20
22
24
26
28
SHIP SPEED, KT

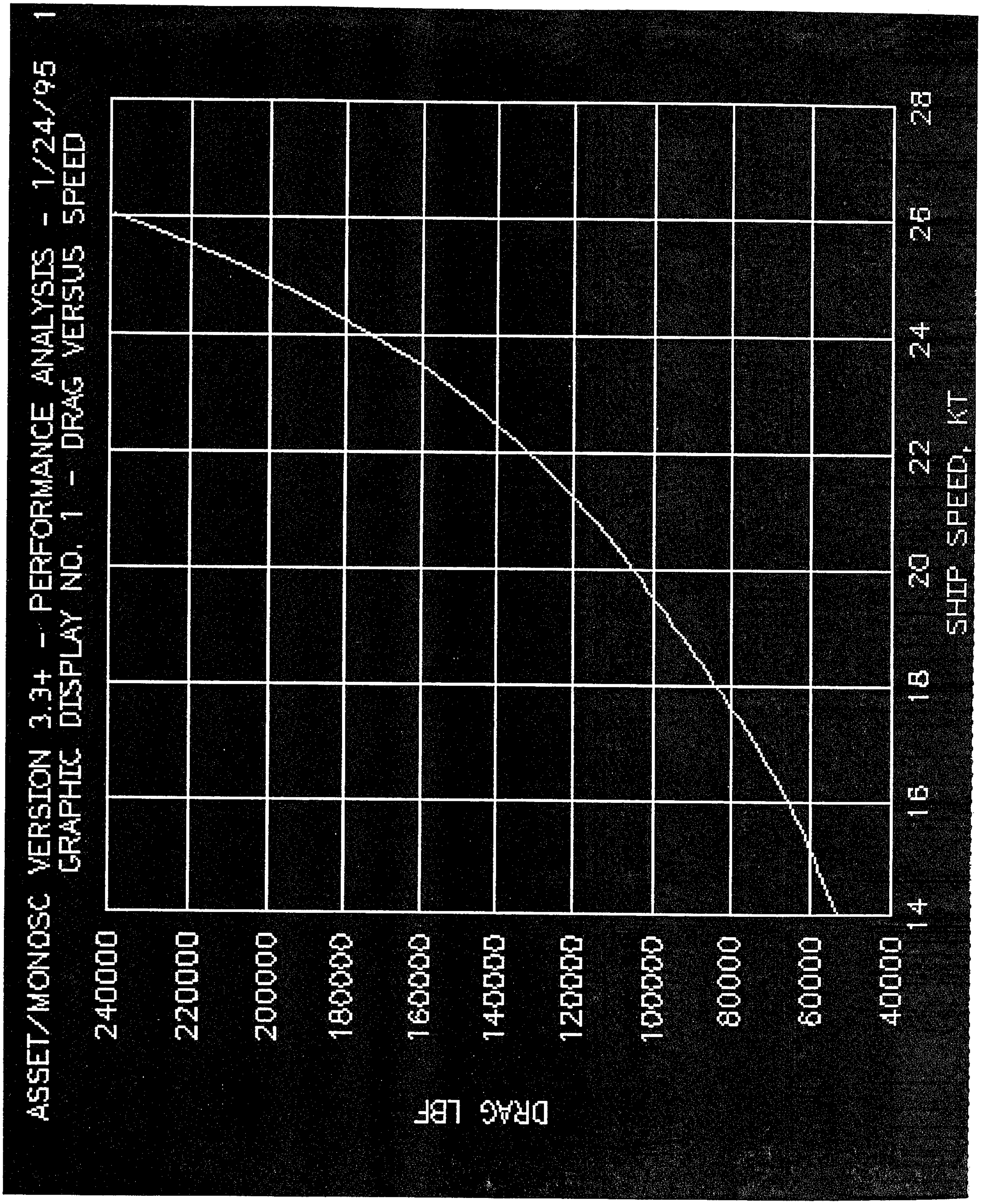

ASSET/MONOSC VERSION 3.3+ - RESISTANCE MODULE - 1/24/95 13.14.05.
GRAPHIC DISPLAY NO. 1 - RESISTANCE VERSUS SPEED
3813 LTON
3591 LTON
RESISTANCE LBF
350000
300000
250000
200000
150000
100000
50000
0
0
5
10
15
20
25
30
SHIP SPEED, KT

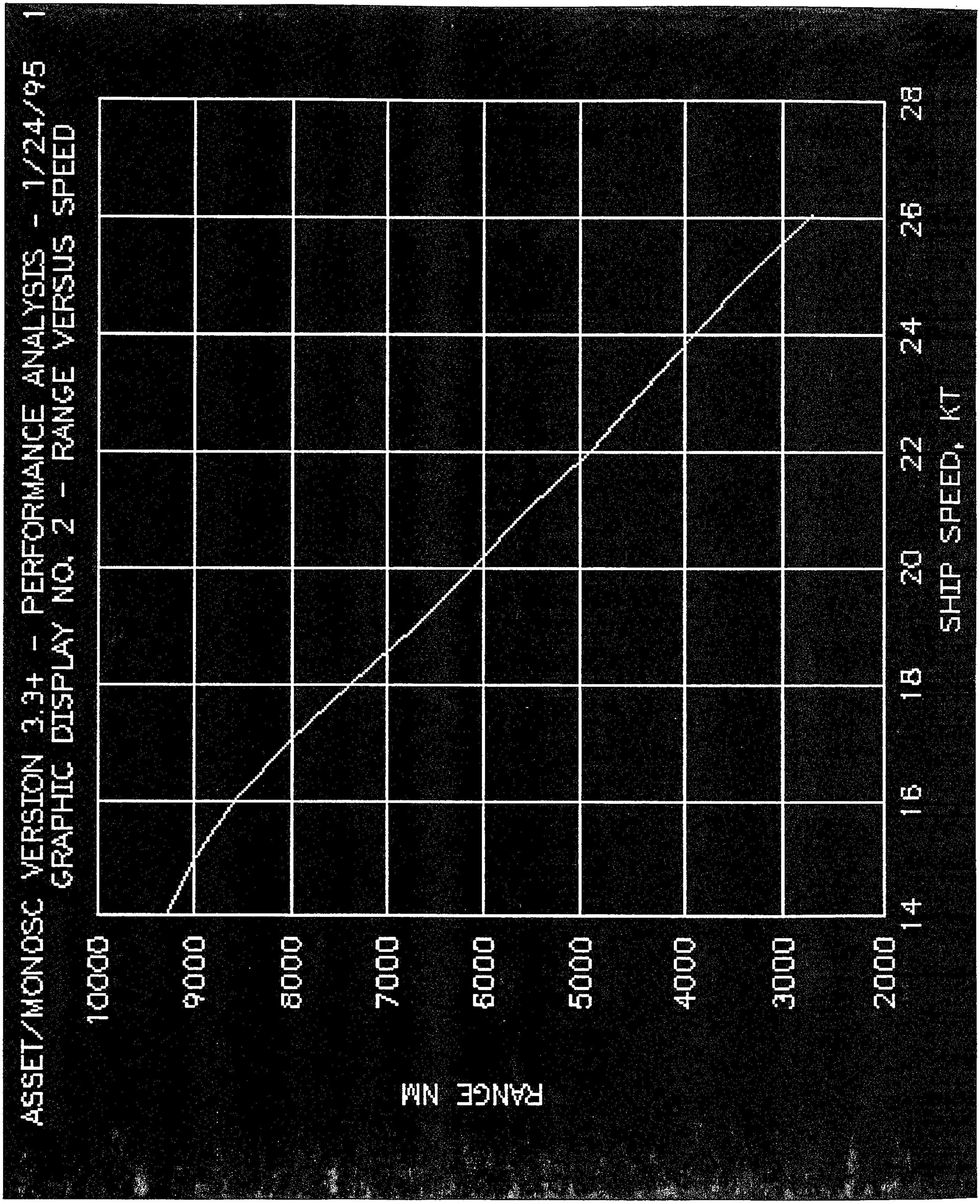
# SECTION 3

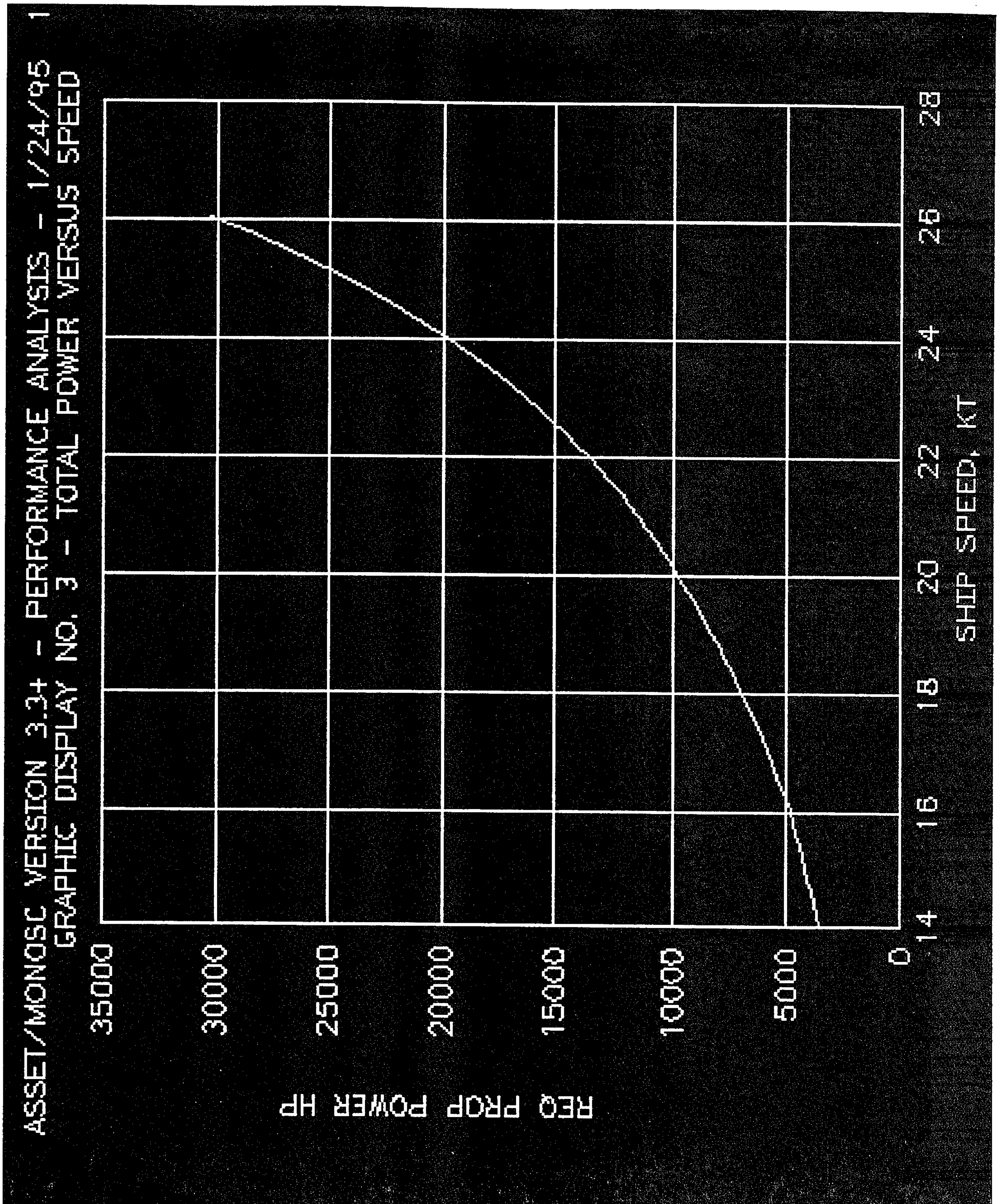
# COAST GUARD VARIANT SPECIFIC REPORTS

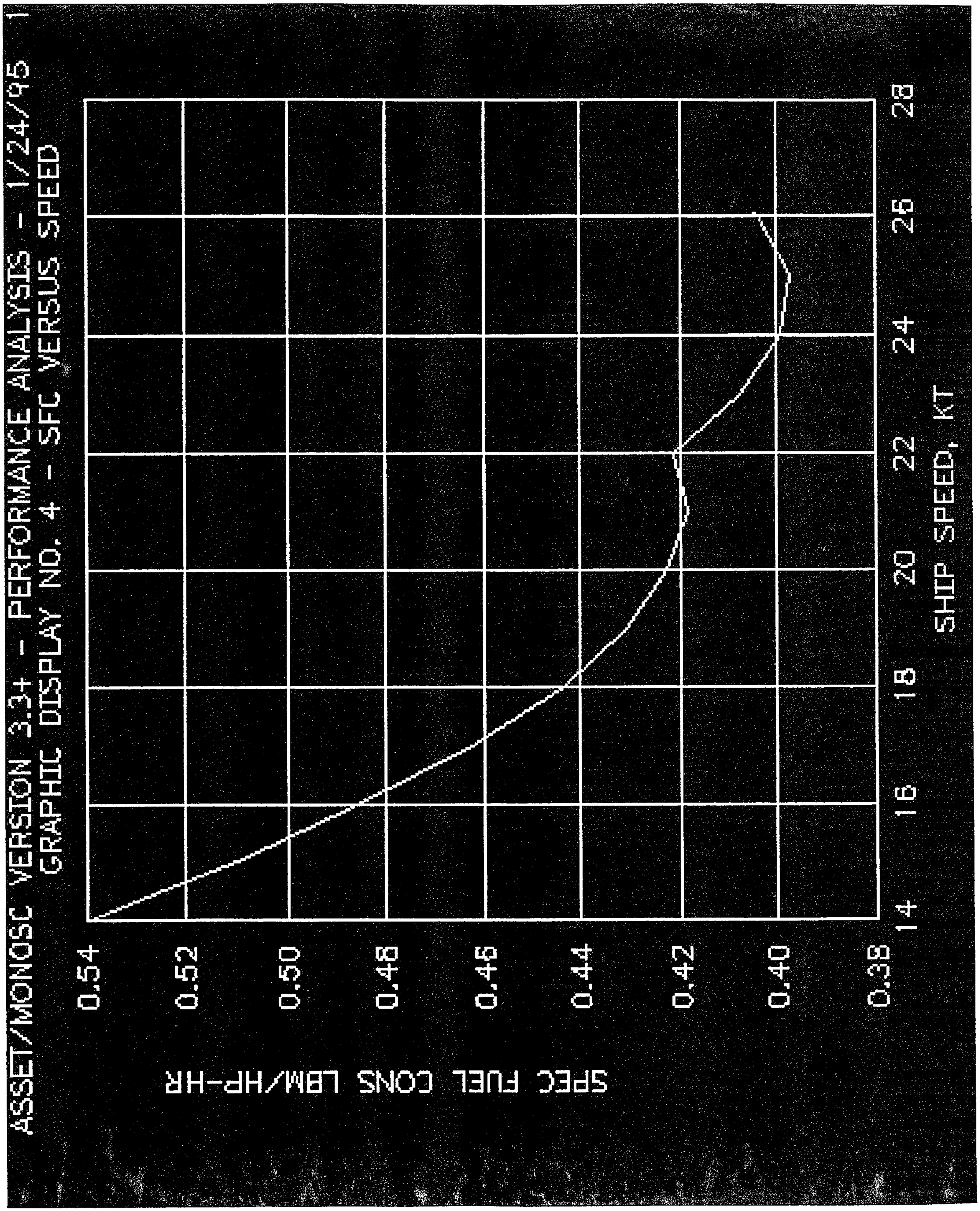

ASSET/MONOSC VERSION 3.3+ - RESISTANCE MODULE - 1/24/95 13.14.05.
GRAPHIC DISPLAY NO. 2 - EHP VERSUS SPEED
PAGE 1 OF 2
EFFECTIVE HORSEPOWER HP
30000
25000
20000
15000
10000
5000
0
0
5
10
15
20
25
30
SHIP SPEED, KT
TOTAL
RESIDUAL
FRICTIONAL
APPENDAGE
MARGIN
WIND
DISPLACEMENT = 3213 LTON

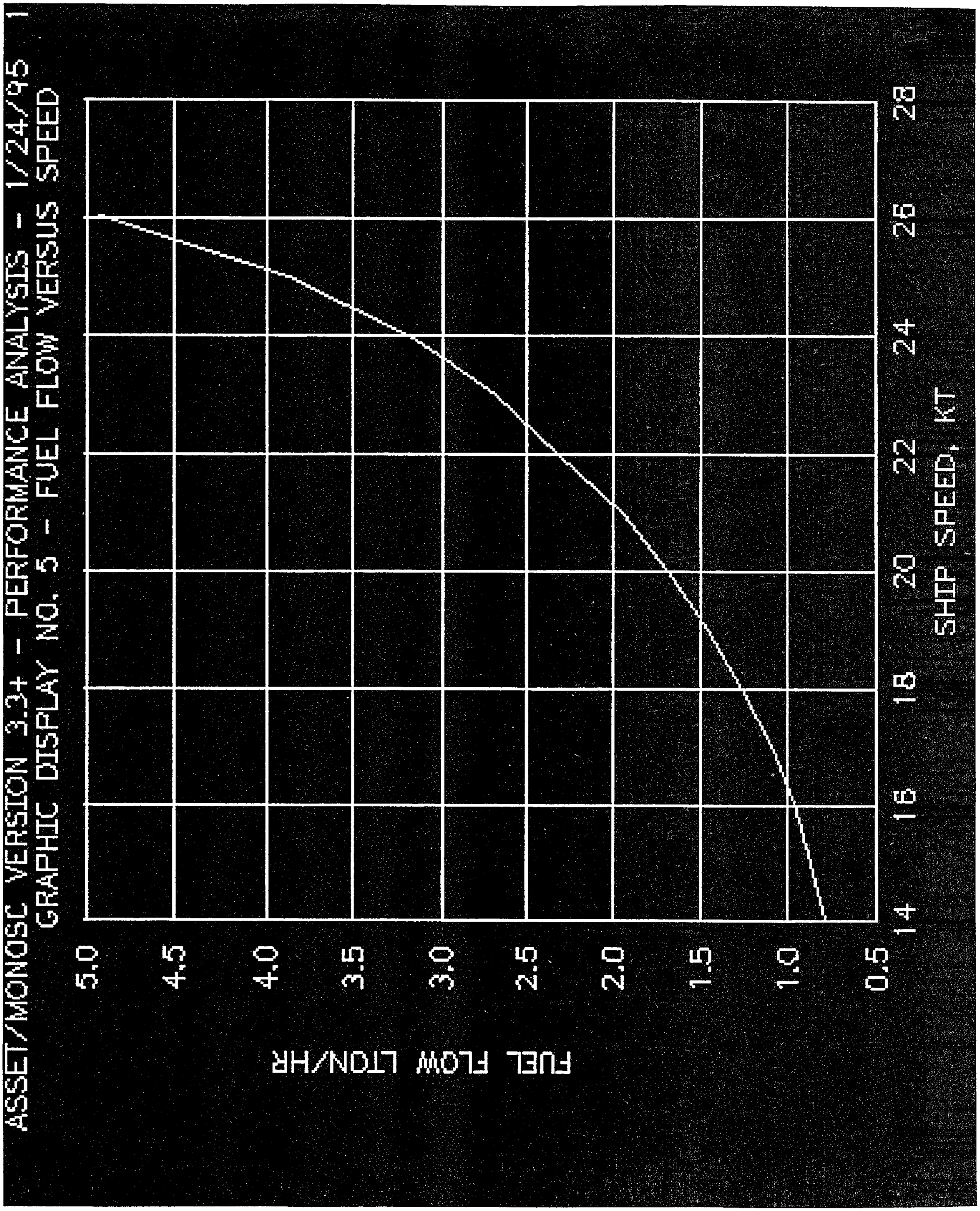

ASSET/MONOSC VERSION 3.3+ - RESISTANCE MODULE - 1/24/95 13.14.05.
GRAPHIC DISPLAY NO. 2 - EHP VERSUS SPEED
PAGE 2 OF 2
TOTAL
RESIDUAL
FRICTIONAL
APPENDAGE
MARGIN
WIND
EFFECTIVE HORSEPOWER HP
30000
25000
20000
15000
10000
5000
0
0
5
10
15
20
25
30
SHIP SPEED, KT
DISPLACEMENT = 3591 LTON

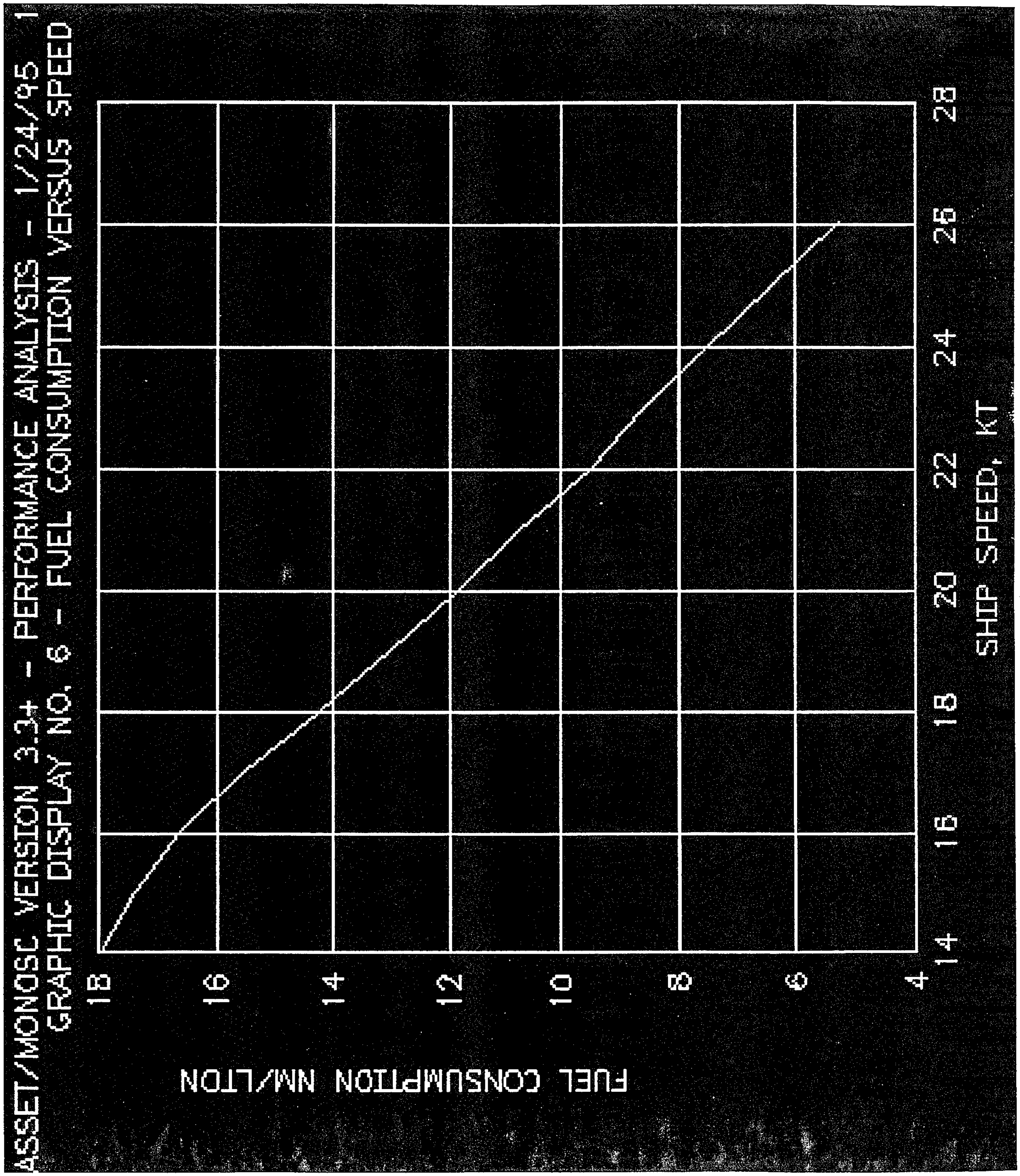

ASSET/MONOSC VERSION 3.3+ - PERFORMANCE ANALYSIS - 1/24/95 1
GRAPHIC DISPLAY NO. 1 - DRAG VERSUS SPEED
DRAG LBF
240000
220000
200000
180000
160000
140000
120000
100000
80000
60000
40000
14
16
18
20
22
24
26
28
SHIP SPEED, KT


ASSET/MONOSC VERSION 3.3+ - PERFORMANCE ANALYSIS - 1/24/95 1
GRAPHIC DISPLAY NO. 2 - RANGE VERSUS SPEED
RANGE NM
10000
9000
8000
7000
6000
5000
4000
3000
2000
SHIP SPEED, KT
14
16
18
20
22
24
26
28


ASSET/MONOSC VERSION 3.3+ - PERFORMANCE ANALYSIS - 1/24/95 1
GRAPHIC DISPLAY NO. 3 - TOTAL POWER VERSUS SPEED
REQ PROP POWER HP
35000
30000
25000
20000
15000
10000
5000
0
14
16
18
20
22
24
26
28
SHIP SPEED, KT


ASSET/MONOSC VERSION 3.3+ - PERFORMANCE ANALYSIS - 1/24/95 1
GRAPHIC DISPLAY NO. 4 - SFC VERSUS SPEED
SPEC FUEL CONS LBM/HP-HR
0.54
0.52
0.50
0.48
0.46
0.44
0.42
0.40
0.38
SHIP SPEED, KT
14
16
18
20
22
24
26
28


ASSET/MONOSC VERSION 3.3+ - PERFORMANCE ANALYSIS - 1/24/95 1
GRAPHIC DISPLAY NO. 5 - FUEL FLOW VERSUS SPEED
FUEL FLOW LTON/HR
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
14
16
18
20
22
24
26
28
SHIP SPEED, KT


ASSET/MONOSC VERSION 3.3+ - PERFORMANCE ANALYSIS - 1/24/95 1
GRAPHIC DISPLAY NO. 6 - FUEL CONSUMPTION VERSUS SPEED
FUEL CONSUMPTION NM/LTON
18
16
14
12
10
8
6
4
SHIP SPEED, KT
14
16
18
20
22
24
26
28

# APPENDIX P

## NAVAL ARCHITECTURE DATA

# SUMMARY

This appendix (P) contains the data calculated by GHS for developing the charts in the Naval Architecture section of this design report. All of the charts were generated by GHS, with the exception of the Floodable Length Curve which was generated using Microsoft Excel v5.0.

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HYDROSTATIC PROPERTIES
Trim: Fwd 0.53 deg., No Heel, VCG = 20.21

| LCF Draft | Displacement Weight (LT) | Buoyancy-Ctr. LCB | VCB | Weight/ Inch | LCF | Moment/ Deg trim | KML | KMT |
|---|---|---|---|---|---|---|---|---|
| 2.000 | 122.52 | 133.89a | 1.30 | 8.06 | 150.57a | 4871.36 | 2298.0 | 23.36 |
| 4.000 | 403.64 | 151.72a | 2.54 | 13.59 | 165.33a | 9843.80 | 1417.3 | 28.74 |
| 6.000 | 801.76 | 161.05a | 3.79 | 18.04 | 174.71a | 15255 | 1110.2 | 29.58 |
| 8.000 | 1,300.48 | 168.02a | 5.03 | 21.80 | 183.29a | 21435 | 964.4 | 28.75 |
| 10.000 | 1,880.38 | 173.83a | 6.26 | 24.98 | 190.39a | 28010 | 873.6 | 27.62 |
| 12.000 | 2,539.82 | 179.11a | 7.50 | 28.10 | 197.98a | 36206 | 836.9 | 26.90 |
| 14.000 | 3,271.11 | 184.08a | 8.74 | 30.94 | 205.07a | 45324 | 814.0 | 26.33 |
| 16.000 | 4,076.32 | 189.02a | 9.98 | 33.84 | 212.49a | 57080 | 822.4 | 25.95 |
| 18.000 | 4,914.28 | 193.21a | 11.18 | 35.43 | 213.40a | 63191 | 756.9 | 25.60 |
| 20.000 | 5,773.68 | 196.12a | 12.34 | 36.65 | 212.09a | 67414 | 689.1 | 25.55 |
| 22.000 | 6,662.25 | 198.15a | 13.50 | 37.96 | 210.50a | 72092 | 640.1 | 25.84 |
| 24.000 | 7,581.86 | 199.54a | 14.65 | 39.32 | 208.73a | 77142 | 603.1 | 26.35 |
| 26.000 | 8,533.83 | 200.48a | 15.81 | 40.66 | 207.02a | 81946 | 570.3 | 27.00 |
| 28.000 | 9,516.36 | 201.05a | 16.97 | 42.00 | 204.98a | 87154 | 544.9 | 27.73 |
| 30.000 | 10,472.61 | 201.27a | 18.06 | 32.37 | 194.51a | 89239 | 508.4 | 25.36 |

Distances in FEET.-------Specific Gravity = 1.025.-----------Moment in Ft-LT.
Draft is from Baseline.

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CPCX

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CURVES OF FORM
HULL.C Component of Part HULL

Trim: zero Heel: zero

| Ref Pt Depth | Volume (Cu Ft) | Block Coef | Displ/ Length | WaterPl Coef | MaxSect Coef | PrismaticCoefs Long | Vert |
|---|---|---|---|---|---|---|---|
| 2.00 | 4510 | 0.351 | 8.0 | 0.590 | 0.634 | 0.559 | 0.595 |
| 4.00 | 14368 | 0.358 | 18.7 | 0.604 | 0.656 | 0.549 | 0.593 |
| 6.00 | 28338 | 0.370 | 29.7 | 0.623 | 0.678 | 0.549 | 0.595 |
| 8.00 | 45795 | 0.389 | 40.0 | 0.649 | 0.708 | 0.551 | 0.600 |
| 10.00 | 66164 | 0.405 | 49.0 | 0.668 | 0.737 | 0.553 | 0.606 |
| 12.00 | 89265 | 0.418 | 56.3 | 0.687 | 0.759 | 0.555 | 0.609 |
| 14.00 | 115006 | 0.428 | 61.7 | 0.709 | 0.780 | 0.554 | 0.604 |
| 16.00 | 143062 | 0.456 | 74.2 | 0.733 | 0.796 | 0.576 | 0.622 |
| 18.00 | 172210 | 0.481 | 88.2 | 0.746 | 0.811 | 0.596 | 0.645 |
| 20.00 | 202311 | 0.501 | 102.3 | 0.760 | 0.821 | 0.613 | 0.660 |
| 22.00 | 233438 | 0.518 | 116.6 | 0.775 | 0.830 | 0.627 | 0.669 |
| 24.00 | 265644 | 0.534 | 131.0 | 0.791 | 0.836 | 0.640 | 0.675 |
| 26.00 | 298960 | 0.547 | 145.6 | 0.807 | 0.841 | 0.652 | 0.678 |
| 28.00 | 333366 | 0.559 | 160.3 | 0.823 | 0.845 | 0.664 | 0.681 |
| 30.00 | 364957 | 0.565 | 173.4 | 0.449 | 0.844 | 0.671 | 1.259 |

Distances in FEET.-----Length is true waterline.----------------------

HULL Reference Point: Long.= 0.00 Trans.= 0.00 Vert.= 0.00

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CROSS CURVES OF STABILITY
Showing righting arms in heel at VCG = 0.00

Trim: zero at zero heel (trim righting arm held at zero)

| Displacement LONG TONS | Heel Angles in Degrees 10.00s | 20.00s | 30.00s | 40.00s | 50.00s | 60.00s |
|---|---|---|---|---|---|---|
| 128.83 | 5.10s | 10.13s | 13.75s | 16.12s | 17.76s | 19.43s |
| 410.42 | 5.31s | 9.82s | 13.30s | 15.88s | 18.04s | 21.20s |
| 809.51 | 5.22s | 9.59s | 13.03s | 15.81s | 18.48s | 21.77s |
| 1,308.16 | 5.06s | 9.39s | 12.91s | 15.95s | 19.06s | 21.73s |
| 1,890.03 | 4.89s | 9.23s | 12.91s | 16.22s | 19.39s | 21.47s |
| 2,549.92 | 4.75s | 9.12s | 12.99s | 16.59s | 19.45s | 21.14s |
| 3,285.22 | 4.65s | 9.05s | 13.13s | 16.81s | 19.33s | 20.75s |
| 4,086.67 | 4.57s | 9.02s | 13.31s | 16.77s | 19.01s | 20.26s |
| 4,919.31 | 4.50s | 9.02s | 13.31s | 16.47s | 18.53s | 19.70s |
| 5,779.16 | 4.48s | 9.05s | 13.09s | 15.98s | 17.94s | 19.12s |
| 6,668.31 | 4.52s | 9.03s | 12.66s | 15.35s | 17.28s | 18.51s |
| 7,588.33 | 4.60s | 8.82s | 12.08s | 14.64s | 16.57s | 17.90s |
| 8,540.00 | 4.65s | 8.39s | 11.39s | 13.87s | 15.84s | 17.29s |
| 9,522.85 | 4.36s | 7.70s | 10.59s | 13.06s | 15.11s | 16.70s |
| 10,425.27 | 3.62s | 6.81s | 9.71s | 12.27s | 14.43s | 16.14s |

Distances in FEET.--Specific Gravity = 1.025.---------------
Free surface ignored.

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CPCX

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FLOODABLE LENGTHS

Initial Origin Depth = 15.50  Initial Trim = 0.00 Degrees
Vertical C.G. = 19.74  Permeability =0.700

| ORIGIN DEPTH | Deg TRIM | FLOODED CENTER | FLOODED LENGTH | MARGIN | GMt |
|---|---|---|---|---|---|
| 37.02 | -4.24 | 81.00 | 205.87 | 0.25 | 8.10 |
| 37.04 | -4.21 | 90.00 | 192.84 | 0.25 | 8.19 |
| 37.07 | -4.11 | 99.00 | 189.40 | 0.25 | 8.41 |
| 37.12 | -3.99 | 108.00 | 190.75 | 0.25 | 8.66 |
| 37.17 | -3.84 | 117.00 | 195.15 | 0.25 | 8.95 |
| 37.22 | -3.67 | 126.00 | 201.96 | 0.25 | 9.26 |
| 37.24 | -3.49 | 135.00 | 211.02 | 0.25 | 9.59 |
| 37.21 | -3.28 | 144.00 | 221.57 | 0.25 | 9.82 |
| 37.10 | -3.04 | 153.00 | 233.55 | 0.25 | 9.88 |
| 36.87 | -2.75 | 162.00 | 247.24 | 0.25 | 9.90 |
| 36.46 | -2.42 | 171.00 | 261.27 | 0.25 | 9.88 |
| 35.80 | -2.03 | 180.00 | 274.32 | 0.25 | 9.78 |
| 34.77 | -1.58 | 189.00 | 284.52 | 0.25 | 9.59 |
| 33.26 | -1.06 | 198.00 | 289.66 | 0.25 | 9.25 |
| 31.20 | -0.49 | 207.00 | 287.37 | 0.25 | 8.78 |
| 28.66 | 0.08 | 216.00 | 278.23 | 0.25 | 8.15 |
| 25.89 | 0.62 | 225.00 | 263.78 | 0.25 | 7.47 |
| 23.09 | 1.10 | 234.00 | 246.88 | 0.25 | 6.79 |
| 20.41 | 1.52 | 243.00 | 229.32 | 0.25 | 6.18 |
| 18.02 | 1.88 | 252.00 | 213.23 | 0.25 | 5.72 |
| 15.93 | 2.20 | 261.00 | 199.40 | 0.25 | 5.39 |
| 14.09 | 2.47 | 270.00 | 187.51 | 0.25 | 5.16 |
| 12.49 | 2.71 | 279.00 | 177.60 | 0.25 | 4.99 |
| 11.08 | 2.92 | 288.00 | 169.00 | 0.25 | 4.89 |
| 9.84 | 3.11 | 297.00 | 161.58 | 0.25 | 4.82 |
| 9.39 | 3.18 | 306.00 | 170.07 | 0.25 | 4.80 |

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HS/FL 1.54 CPCX Page 1
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FLOODABLE LENGTHS

Initial Origin Depth = 15.50 Initial Trim = 0.00 Degrees
Vertical C.G. = 19.74 Permeability =0.950

| ORIGIN DEPTH | Deg TRIM | FLOODED CENTER | FLOODED LENGTH | MARGIN | GMt |
|---|---|---|---|---|---|
| 36.85 | -4.72 | 45.00 | 160.95 | 0.25 | 7.20 |
| 36.85 | -4.72 | 54.00 | 142.97 | 0.25 | 7.20 |
| 36.86 | -4.69 | 63.00 | 130.37 | 0.25 | 7.32 |
| 36.88 | -4.61 | 72.00 | 124.30 | 0.25 | 7.51 |
| 36.92 | -4.52 | 81.00 | 121.30 | 0.25 | 7.71 |
| 36.96 | -4.41 | 90.00 | 120.69 | 0.25 | 7.93 |
| 37.01 | -4.28 | 99.00 | 121.56 | 0.25 | 8.16 |
| 37.06 | -4.14 | 108.00 | 123.84 | 0.25 | 8.44 |
| 37.12 | -3.98 | 117.00 | 127.48 | 0.25 | 8.75 |
| 37.18 | -3.81 | 126.00 | 132.30 | 0.25 | 9.12 |
| 37.24 | -3.61 | 135.00 | 138.29 | 0.25 | 9.54 |
| 37.24 | -3.40 | 144.00 | 145.09 | 0.25 | 9.95 |
| 37.17 | -3.16 | 153.00 | 152.86 | 0.25 | 10.27 |
| 36.97 | -2.86 | 162.00 | 161.31 | 0.25 | 10.51 |
| 36.59 | -2.51 | 171.00 | 169.98 | 0.25 | 10.72 |
| 35.92 | -2.09 | 180.00 | 178.22 | 0.25 | 10.83 |
| 34.84 | -1.61 | 189.00 | 184.70 | 0.25 | 10.75 |
| 33.23 | -1.05 | 198.00 | 188.30 | 0.25 | 10.40 |
| 31.04 | -0.45 | 207.00 | 187.84 | 0.25 | 9.79 |
| 28.37 | 0.14 | 216.00 | 183.42 | 0.25 | 8.97 |
| 25.45 | 0.70 | 225.00 | 175.72 | 0.25 | 8.09 |
| 22.53 | 1.19 | 234.00 | 165.89 | 0.25 | 7.24 |
| 19.82 | 1.61 | 243.00 | 155.43 | 0.25 | 6.51 |
| 17.43 | 1.97 | 252.00 | 145.86 | 0.25 | 5.96 |
| 15.36 | 2.28 | 261.00 | 137.56 | 0.25 | 5.56 |
| 13.58 | 2.55 | 270.00 | 130.42 | 0.25 | 5.25 |
| 12.02 | 2.78 | 279.00 | 124.32 | 0.25 | 5.03 |
| 10.67 | 2.99 | 288.00 | 119.10 | 0.25 | 4.87 |
| 9.47 | 3.17 | 297.00 | 114.49 | 0.25 | 4.75 |
| 8.43 | 3.32 | 306.00 | 110.74 | 0.25 | 4.67 |
| 7.49 | 3.46 | 315.00 | 107.53 | 0.25 | 4.63 |
| 6.66 | 3.59 | 324.00 | 104.90 | 0.25 | 4.61 |
| 6.31 | 3.64 | 333.00 | 113.72 | 0.25 | 4.62 |

nvalid command

CPCX

RIGHTING ARMS vs HEEL ANGLE

Fixed CG: LCG = 187.01a TCG = 0.00 VCG = 20.21

| Origin Depth | Degrees of Trim | Heel | Displacement Weight(LT) | Righting Arms in Trim | in Heel |
|---|---|---|---|---|---|
| 17.790 | 0.53f | 0.00 | 4,001.58 | 0.02f | 0.000 |
| 17.737 | 0.54f | 5.00s | 4,001.09 | 0.00 | 0.674s |
| 17.581 | 0.58f | 10.00s | 4,001.98 | 0.02f | 1.350s |
| 17.273 | 0.62f | 15.00s | 4,001.34 | 0.00 | 2.022s |
| 16.818 | 0.69f | 20.00s | 4,001.31 | 0.00 | 2.696s |
| 16.189 | 0.76f | 25.00s | 4,001.34 | 0.00 | 3.379s |
| 15.356 | 0.84f | 30.00s | 4,001.35 | 0.00 | 4.079s |
| 14.362 | 0.92f | 35.00s | 4,001.32 | 0.00 | 4.663s |
| 13.270 | 1.00f | 40.00s | 4,001.32 | 0.00 | 5.007s |
| 12.090 | 1.08f | 45.00s | 4,001.34 | 0.00 | 5.135s |
| 11.809 | 1.09f | 46.10s | 4,001.35 | 0.04a | 5.140s |
| 10.819 | 1.14f | 50.00s | 4,001.35 | 0.00 | 5.087s |
| 9.464 | 1.19f | 55.00s | 4,001.35 | 0.00 | 4.892s |
| 8.043 | 1.23f | 60.00s | 4,001.36 | 0.00 | 4.579s |

Distances in FEET.--Specific Gravity = 1.025.----------

Note: The Center of Gravity shown above is for the Fixed Weight of 3439.07 LT. As the tank load centers shift with heel and trim, the total Center of Gravity varies. The righting arms shown above include the effect of the C.G. variation.

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CPCX

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WAVE DESCRIPTION

Wave type: TROCHOID
Phase of crest relative to origin: 0.0 degrees (0.00 Ft)
Wave length: 380.00 Ft Crest-to-trough height: 21.44 Ft

LONGITUDINAL STRENGTH

| LOCATION Ft | WEIGHT LT/Ft | BUOYANCY LT/Ft | SHEAR LT | MOMENT LT-Ft |
|---|---|---|---|---|
| 18.36f | 0.00 | | | |
| 18.36f | 0.01 | | -0.0 | 0 |
| 18.00f | 0.03 | | -0.0 | 1 |
| 18.00f | 0.07 | | -0.0 | 1 |
| 15.12f | 0.17 | 0.00 | -0.4 | 5 |
| 9.18f | 0.39 | 0.95 | 0.8 | 15 |
| 0.00 | 0.88 | 3.84 | 17.0 | -37 |
| 0.00 | 0.93 | 3.84 | 17.0 | -37 |
| 6.50a | 1.71 | 5.68 | 39.3 | -207 |
| 6.50a | 2.04 | 5.68 | 39.3 | -207 |
| 13.00a | 2.81 | 7.35 | 65.9 | -536 |
| 15.00a | | 7.80 | 75.4 | -674 |
| 15.00a | 24.09* | 7.80 | 51.3 | -674 |
| 18.80a | 2.95 | 8.64 | 71.5 | -901 |
| 18.80a | 2.18 | 8.64 | 71.5 | -901 |
| 22.57a | 2.13 | 9.48 | 97.5 | -1,213 |
| 25.00a | | 9.91 | 115.7 | -1,469 |
| 25.00a | 5.05* | 9.91 | 110.7 | -1,469 |
| 27.02a | 2.37 | 10.27 | 126.4 | -1,704 |
| 32.13a | 2.62 | 11.18 | 168.5 | -2,450 |
| 41.69a | 3.06 | 12.44 | 254.2 | -4,450 |
| 42.50a | 3.10 | 12.51 | 261.8 | -4,657 |
| 42.50a | 3.16 | 12.51 | 261.8 | -4,657 |
| 50.08a | 3.55 | 13.21 | 333.9 | -6,902 |
| 51.25a | 3.60 | 13.32 | 345.2 | -7,298 |
| 54.00a | | 13.48 | 372.0 | -8,280 |
| 54.00a | 9.80* | 13.48 | 362.2 | -8,280 |
| 55.00a | | 13.54 | 372.0 | -8,646 |
| 55.00a | 26.39* | 13.54 | 345.6 | -8,646 |
| 60.81a | 4.03 | 13.87 | 402.5 | -10,810 |
| 65.50a | 4.21 | 13.98 | 448.5 | -12,799 |
| 65.50a | 4.37 | 13.98 | 448.5 | -12,800 |
| 68.00a | 4.50 | 14.04 | 472.4 | -13,947 |
| 68.00a | 12.35 | 14.04 | 472.4 | -13,947 |
| 70.38a | 12.47 | 14.10 | 476.4 | -15,073 |
| 73.40a | 12.62 | 14.10 | 481.1 | -16,514 |
| 79.94a | 12.90 | 14.10 | 489.8 | -19,681 |
| 88.00a | 14.08 | 13.93 | 494.1 | -23,641 |
| 88.00a | 6.23 | 13.93 | 494.1 | -23,642 |
| 88.50a | 6.31 | 13.92 | 497.9 | -23,889 |

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| LOCATION Ft | WEIGHT LT/Ft | BUOYANCY LT/Ft | SHEAR LT | MOMENT LT-Ft |
|---|---|---|---|---|
| 88.50a | 5.78 | 13.92 | 497.9 | -23,889 |
| 89.50a | 5.94 | 13.89 | 505.9 | -24,389 |
| 90.00a | 5.98 | 13.87 | 509.9 | -24,642 |
| 90.00a | 6.85 | 13.87 | 509.9 | -24,643 |
| 91.00a | 6.94 | 13.83 | 516.9 | -25,154 |
| 91.00a | 8.37 | 13.83 | 516.9 | -25,154 |
| 92.00a | | 13.79 | 522.3 | -25,672 |
| 92.00a | 2.00* | 13.79 | 520.3 | -25,673 |
| 95.00a | | 13.67 | 535.6 | -27,252 |
| 95.00a | 6.10* | 13.67 | 529.6 | -27,252 |
| 98.46a | 9.04 | 13.53 | 545.8 | -29,106 |
| 98.50a | 9.05 | 13.53 | 546.0 | -29,130 |
| 98.50a | 9.74 | 13.53 | 546.0 | -29,130 |
| 99.07a | 9.79 | 13.50 | 548.1 | -29,438 |
| 99.07a | 9.79 | 13.50 | 548.2 | -29,441 |
| 103.00a | | 13.29 | 560.1 | -31,615 |
| 103.00a | 8.10* | 13.29 | 552.0 | -31,615 |
| 106.00a | | 13.13 | 557.6 | -33,276 |
| 106.00a | 5.00* | 13.13 | 552.6 | -33,276 |
| 108.00a | 12.36 | 13.02 | 554.6 | -34,380 |
| 108.00a | 11.60 | 13.02 | 544.4 | -34,380 |
| 108.00a | | 13.02 | 544.4 | -34,380 |
| 108.00a | 10.20* | 13.02 | 544.4 | -34,380 |
| 108.63a | 11.78 | 12.99 | 545.2 | -34,722 |
| 112.10a | 11.88 | 12.75 | 548.8 | -36,616 |
| 112.10a | 12.01 | 12.75 | 548.8 | -36,616 |
| 113.00a | 12.05 | 12.68 | 549.4 | -37,109 |
| 113.00a | 11.45 | 12.68 | 549.4 | -37,109 |
| 114.00a | | 12.61 | 550.6 | -37,657 |
| 114.00a | 0.70* | 12.61 | 549.9 | -37,658 |
| 115.00a | 11.54 | 12.55 | 551.0 | -38,206 |
| 115.00a | 12.74 | 12.55 | 548.9 | -38,207 |
| 115.00a | | 12.55 | 548.9 | -38,207 |
| 115.00a | 2.10* | 12.55 | 548.9 | -38,207 |
| 117.00a | 12.83 | 12.41 | 548.3 | -39,301 |
| 117.00a | 13.02 | 12.41 | 548.3 | -39,301 |
| 117.35a | 13.03 | 12.38 | 548.0 | -39,493 |
| 118.19a | 13.06 | 12.33 | 547.5 | -39,951 |
| 120.00a | | 12.19 | 546.0 | -40,938 |
| 120.00a | 3.15* | 12.19 | 542.8 | -40,938 |
| 123.00a | | 11.97 | 539.6 | -42,557 |
| 123.00a | 4.30* | 11.97 | 533.0 | -42,558 |
| 123.00a | | 11.97 | 539.6 | -42,557 |
| 123.00a | 2.30* | 11.97 | 533.0 | -42,558 |
| 126.00a | | 11.74 | 528.8 | -44,146 |
| 126.00a | 4.00* | 11.74 | 524.8 | -44,146 |
| 127.08a | 13.33 | 11.66 | 523.0 | -44,712 |
| 127.75a | 13.34 | 11.61 | 521.9 | -45,059 |
| 130.00a | 13.38 | 11.43 | 517.8 | -46,226 |

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| LOCATION Ft | WEIGHT LT/Ft | BUOYANCY LT/Ft | SHEAR LT | MOMENT LT-Ft |
|---|---|---|---|---|
| 130.00a | 12.18 | 11.43 | 517.8 | -46,226 |
| 135.70a | 12.29 | 10.96 | 511.8 | -49,153 |
| 135.70a | 12.56 | 10.96 | 511.8 | -49,153 |
| 136.45a | 12.59 | 10.90 | 510.6 | -49,536 |
| 136.45a | 18.97 | 10.90 | 510.6 | -49,536 |
| 136.50a | 18.97 | 10.90 | 510.2 | -49,561 |
| 136.50a | 18.76 | 10.90 | 510.2 | -49,561 |
| 137.00a | | 10.86 | 506.2 | -49,814 |
| 137.00a | 10.00* | 10.86 | 496.2 | -49,815 |
| 137.32a | 18.79 | 10.83 | 493.7 | -49,970 |
| 146.88a | 19.13 | 10.06 | 412.3 | -54,298 |
| 147.03a | 19.13 | 10.04 | 410.9 | -54,359 |
| 152.00a | | 9.66 | 364.6 | -56,280 |
| 152.00a | 15.54* | 9.66 | 349.1 | -56,280 |
| 153.00a | | 9.58 | 339.5 | -56,623 |
| 153.00a | 1.00* | 9.58 | 338.5 | -56,623 |
| 156.33a | 19.28 | 9.32 | 305.8 | -57,691 |
| 156.44a | 19.28 | 9.32 | 304.7 | -57,725 |
| 166.00a | 19.29 | 8.65 | 206.2 | -60,158 |
| 170.24a | 18.79 | 8.40 | 161.6 | -60,932 |
| 170.24a | 19.21 | 8.40 | 161.6 | -60,932 |
| 171.97a | 19.05 | 8.29 | 143.0 | -61,193 |
| 171.97a | 12.67 | 8.29 | 143.0 | -61,193 |
| 172.00a | 12.67 | 8.29 | 142.8 | -61,197 |
| 172.00a | 12.92 | 8.29 | 142.8 | -61,197 |
| 175.00a | 12.64 | 8.11 | 129.1 | -61,600 |
| 175.00a | 13.10 | 8.11 | 129.1 | -61,600 |
| 175.57a | 13.04 | 8.08 | 126.3 | -61,672 |
| 175.57a | 13.04 | 8.08 | 126.3 | -61,672 |
| 177.77a | 12.97 | 7.98 | 115.3 | -61,935 |
| 180.00a | | 7.88 | 104.2 | -62,176 |
| 180.00a | 4.10* | 7.88 | 100.1 | -62,176 |
| 184.83a | 12.64 | 7.66 | 76.0 | -62,595 |
| 185.13a | 12.63 | 7.65 | 74.5 | -62,617 |
| 191.00a | | 7.47 | 45.9 | -62,961 |
| 191.00a | 45.78* | 7.47 | 0.1 | -62,961 |
| 194.69a | 12.02 | 7.36 | -17.3 | -62,924 |
| 195.00a | | 7.36 | -18.7 | -62,918 |
| 195.00a | 3.30* | 7.36 | -22.0 | -62,918 |
| 198.00a | | 7.32 | -35.9 | -62,827 |
| 198.00a | 1.90* | 7.32 | -37.8 | -62,827 |
| 199.40a | 11.88 | 7.30 | -44.2 | -62,768 |
| 199.40a | 12.12 | 7.30 | -44.2 | -62,768 |
| 200.00a | | 7.29 | -47.1 | -62,739 |
| 200.00a | 4.30* | 7.29 | -51.4 | -62,739 |
| 201.00a | 12.11 | 7.27 | -56.3 | -62,684 |
| 201.00a | 11.75 | 7.27 | -56.3 | -62,684 |
| 202.00a | 11.74 | 7.26 | -60.7 | -62,624 |
| 202.00a | 12.19 | 7.26 | -60.7 | -62,624 |

| LOCATION Ft | WEIGHT LT/Ft | BUOYANCY LT/Ft | SHEAR LT | MOMENT LT-Ft |
|---|---|---|---|---|
| 204.25a | 12.17 | 7.23 | -71.9 | -62,472 |
| 205.00a | 12.09 | 7.23 | -75.5 | -62,415 |
| 205.00a | 11.63 | 7.23 | -75.5 | -62,415 |
| 207.48a | 11.37 | 7.22 | -86.1 | -62,211 |
| 212.00a | | 7.22 | -103.6 | -61,775 |
| 212.00a | 3.15* | 7.22 | -106.8 | -61,775 |
| 213.90a | 10.60 | 7.22 | -113.4 | -61,562 |
| 215.00a | 10.46 | 7.22 | -117.1 | -61,434 |
| 215.00a | 11.36 | 7.22 | -119.6 | -61,434 |
| 215.00a | | 7.22 | -119.6 | -61,434 |
| 215.00a | 2.50* | 7.22 | -119.6 | -61,434 |
| 215.24a | 11.33 | 7.22 | -120.5 | -61,406 |
| 215.24a | 11.33 | 7.22 | -120.6 | -61,405 |
| 216.00a | | 7.23 | -123.7 | -61,311 |
| 216.00a | 4.10* | 7.23 | -127.8 | -61,311 |
| 222.00a | | 7.32 | -151.0 | -60,465 |
| 222.00a | 29.99* | 7.32 | -181.0 | -60,465 |
| 225.00a | | 7.36 | -191.9 | -59,901 |
| 225.00a | 3.20* | 7.36 | -195.1 | -59,901 |
| 226.22a | 10.83 | 7.38 | -199.3 | -59,659 |
| 228.90a | 10.76 | 7.45 | -208.4 | -59,109 |
| 228.90a | 11.28 | 7.45 | -208.4 | -59,108 |
| 230.00a | 11.27 | 7.47 | -212.6 | -58,875 |
| 230.00a | 9.91 | 7.47 | -212.6 | -58,875 |
| 230.50a | 9.91 | 7.49 | -213.8 | -58,768 |
| 230.50a | 16.28 | 7.49 | -213.8 | -58,768 |
| 237.21a | 16.23 | 7.65 | -272.0 | -57,129 |
| 241.00a | | 7.80 | -304.2 | -56,030 |
| 241.00a | 36.49* | 7.80 | -340.7 | -56,029 |
| 244.37a | 16.12 | 7.93 | -368.6 | -54,829 |
| 247.63a | 16.02 | 8.05 | -394.9 | -53,580 |
| 248.00a | | 8.07 | -397.9 | -53,433 |
| 248.00a | 15.54* | 8.07 | -413.4 | -53,433 |
| 248.19a | 16.00 | 8.07 | -414.9 | -53,354 |
| 250.00a | | 8.16 | -429.0 | -52,587 |
| 250.00a | 4.10* | 8.16 | -433.1 | -52,587 |
| 259.17a | 14.47 | 8.58 | -494.9 | -48,307 |
| 259.17a | 14.47 | 8.59 | -494.9 | -48,304 |
| 264.32a | 14.86 | 8.88 | -525.5 | -45,672 |
| 264.32a | 14.22 | 8.88 | -525.5 | -45,672 |
| 266.00a | 14.44 | 8.97 | -534.6 | -44,779 |
| 266.00a | 8.06 | 8.97 | -534.6 | -44,779 |
| 266.32a | 8.10 | 8.99 | -534.3 | -44,608 |
| 266.32a | 12.90 | 8.99 | -534.3 | -44,608 |
| 268.89a | 13.01 | 9.14 | -544.3 | -43,219 |
| 270.00a | 13.04 | 9.20 | -548.6 | -42,610 |
| 270.00a | 13.50 | 9.20 | -553.6 | -42,610 |
| 270.00a | | 9.20 | -553.6 | -42,610 |
| 270.00a | 5.00* | 9.20 | -553.6 | -42,610 |

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| LOCATION Ft | WEIGHT LT/Ft | BUOYANCY LT/Ft | SHEAR LT | MOMENT LT-Ft |
|---|---|---|---|---|
| 270.16a | 13.50 | 9.21 | -554.2 | -42,521 |
| 275.00a | | 9.51 | -572.8 | -39,785 |
| 275.00a | 9.60* | 9.51 | -582.4 | -39,785 |
| 277.70a | 12.57 | 9.68 | -590.9 | -38,198 |
| 281.14a | 12.11 | 9.89 | -599.7 | -36,143 |
| 281.14a | 12.11 | 9.89 | -599.7 | -36,140 |
| 288.00a | | 10.35 | -606.7 | -31,986 |
| 288.00a | 6.10* | 10.35 | -612.8 | -31,986 |
| 291.07a | 9.28 | 10.56 | -610.5 | -30,102 |
| 292.13a | 9.01 | 10.63 | -609.0 | -29,455 |
| 294.50a | 8.50 | 10.78 | -604.4 | -28,013 |
| 294.50a | 9.55 | 10.78 | -604.4 | -28,013 |
| 297.00a | 9.02 | 10.94 | -600.4 | -26,503 |
| 297.00a | 8.11 | 10.94 | -600.4 | -26,503 |
| 300.00a | | 11.14 | -590.7 | -24,712 |
| 300.00a | 5.00* | 11.14 | -595.7 | -24,711 |
| 300.77a | 7.32 | 11.19 | -592.8 | -24,255 |
| 303.11a | 6.79 | 11.34 | -582.9 | -22,874 |
| 314.09a | 5.80 | 11.99 | -524.0 | -16,764 |
| 323.00a | 5.04 | 12.38 | -463.8 | -12,342 |
| 323.00a | 4.89 | 12.38 | -463.8 | -12,342 |
| 323.30a | 4.87 | 12.40 | -461.5 | -12,203 |
| 323.30a | 3.56 | 12.40 | -461.5 | -12,203 |
| 324.00a | 3.54 | 12.43 | -455.3 | -11,881 |
| 324.00a | 3.36 | 12.43 | -455.3 | -11,881 |
| 325.08a | 3.33 | 12.48 | -445.5 | -11,395 |
| 336.06a | 3.11 | 12.76 | -342.3 | -7,047 |
| 347.05a | 2.89 | 12.69 | -235.5 | -3,856 |
| 358.03a | 2.68 | 12.23 | -129.2 | -1,839 |
| 360.00a | | 12.07 | -110.5 | -1,600 |
| 360.00a | 56.78* | 12.07 | -167.3 | -1,600 |
| 369.02a | 2.49 | 11.32 | -85.1 | -453 |
| 378.00a | | 10.16 | -10.3 | -18 |
| 378.00a | 5.05* | 10.16 | -15.4 | -18 |
| 380.00a | 2.32 | 9.90 | -0.0 | -0 |
| 380.00a | 0.00 | | | |

* Point weight in LONG TONS

S U M M A R Y

| | | | |
|---|---|---|---|
| Largest Shear: | -612.8 LT | at | 288.00a |
| Largest Bending Moment: | -62,961 LT-Ft | at | 191.00a (Sagging) |

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WAVE DESCRIPTION

Wave type: TROCHOID
Phase of crest relative to origin: 180.0 degrees (190.00 Ft)
Wave length: 380.00 Ft Crest-to-trough height: 21.44 Ft

LONGITUDINAL STRENGTH

| LOCATION Ft | WEIGHT LT/Ft | BUOYANCY LT/Ft | SHEAR LT | MOMENT LT-Ft |
|---|---|---|---|---|
| 18.36f | 0.00 | | | |
| 18.36f | 0.01 | | -0.0 | 0 |
| 18.00f | 0.03 | | -0.0 | 0 |
| 18.00f | 0.07 | | -0.0 | 0 |
| 9.18f | 0.39 | | -2.0 | 9 |
| 0.00 | 0.88 | | -7.9 | 54 |
| 0.00 | 0.93 | | -7.9 | 54 |
| 6.50a | 1.71 | | -16.5 | 132 |
| 6.50a | 2.04 | | -16.5 | 132 |
| 8.72a | 2.30 | 0.00 | -21.3 | 175 |
| 13.00a | 2.81 | 0.09 | -32.0 | 289 |
| 15.00a | | 0.12 | -37.4 | 359 |
| 15.00a | 24.10* | 0.12 | -61.5 | 359 |
| 18.80a | 2.96 | 0.16 | -72.1 | 614 |
| 18.80a | 2.18 | 0.16 | -72.1 | 614 |
| 22.57a | 2.12 | 0.20 | -79.5 | 900 |
| 25.00a | | 0.24 | -84.3 | 1,100 |
| 25.00a | 5.05* | 0.24 | -89.3 | 1,100 |
| 32.13a | 2.62 | 0.36 | -104.6 | 1,793 |
| 41.69a | 3.09 | 0.57 | -127.4 | 2,902 |
| 42.50a | 3.13 | 0.60 | -129.5 | 3,007 |
| 42.50a | 3.14 | 0.60 | -129.5 | 3,007 |
| 51.25a | 3.58 | 0.94 | -152.1 | 4,240 |
| 54.00a | | 1.10 | -159.4 | 4,670 |
| 54.00a | 9.80* | 1.10 | -169.2 | 4,670 |
| 55.00a | | 1.16 | -171.8 | 4,840 |
| 55.00a | 26.40* | 1.16 | -198.2 | 4,840 |
| 60.81a | 4.06 | 1.51 | -213.1 | 6,037 |
| 65.50a | 4.27 | 1.92 | -224.6 | 7,065 |
| 65.50a | 4.35 | 1.92 | -224.6 | 7,065 |
| 68.00a | 4.47 | 2.13 | -230.6 | 7,635 |
| 68.00a | 12.32 | 2.13 | -230.6 | 7,635 |
| 70.38a | 12.43 | 2.34 | -254.7 | 8,213 |
| 79.94a | 12.91 | 3.54 | -347.7 | 11,101 |
| 88.00a | 14.17 | 4.90 | -422.8 | 14,209 |
| 88.00a | 6.32 | 4.90 | -422.8 | 14,209 |
| 88.50a | 6.40 | 4.99 | -423.5 | 14,421 |
| 88.50a | 5.76 | 4.99 | -423.5 | 14,421 |
| 89.50a | 5.92 | 5.15 | -424.3 | 14,845 |
| 90.00a | 5.96 | 5.26 | -424.7 | 15,057 |

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| LOCATION Ft | WEIGHT LT/Ft | BUOYANCY LT/Ft | SHEAR LT | MOMENT LT-Ft |
|---|---|---|---|---|
| 90.00a | 6.84 | 5.26 | -424.7 | 15,057 |
| 91.00a | 6.92 | 5.47 | -426.2 | 15,483 |
| 91.00a | 8.35 | 5.47 | -426.2 | 15,483 |
| 92.00a | | 5.69 | -429.0 | 15,911 |
| 92.00a | 2.00* | 5.69 | -431.0 | 15,911 |
| 95.00a | | 6.33 | -438.7 | 17,217 |
| 95.00a | 6.10* | 6.33 | -444.8 | 17,217 |
| 98.50a | 9.02 | 7.07 | -452.4 | 18,788 |
| 98.50a | 9.69 | 7.07 | -452.4 | 18,788 |
| 99.07a | 9.74 | 7.20 | -453.8 | 19,044 |
| 99.07a | 9.74 | 7.20 | -453.8 | 19,047 |
| 103.00a | | 8.22 | -464.1 | 20,851 |
| 103.00a | 8.10* | 8.22 | -472.2 | 20,851 |
| 106.00a | | 8.99 | -480.5 | 22,281 |
| 106.00a | 5.00* | 8.99 | -485.5 | 22,281 |
| 108.00a | 12.41 | 9.51 | -491.2 | 23,258 |
| 108.00a | 11.65 | 9.51 | -501.4 | 23,258 |
| 108.00a | | 9.51 | -501.4 | 23,258 |
| 108.00a | 10.20* | 9.51 | -501.4 | 23,258 |
| 108.63a | 11.84 | 9.68 | -502.8 | 23,575 |
| 112.10a | 11.98 | 10.69 | -508.8 | 25,332 |
| 112.10a | 11.95 | 10.69 | -508.8 | 25,332 |
| 113.00a | 11.99 | 10.95 | -509.8 | 25,790 |
| 113.00a | 11.39 | 10.95 | -509.8 | 25,791 |
| 114.00a | | 11.24 | -510.2 | 26,301 |
| 114.00a | 0.70* | 11.24 | -510.9 | 26,301 |
| 115.00a | 11.48 | 11.53 | -510.9 | 26,812 |
| 115.00a | 12.68 | 11.53 | -513.0 | 26,812 |
| 115.00a | | 11.53 | -513.0 | 26,812 |
| 115.00a | 2.10* | 11.53 | -513.0 | 26,812 |
| 117.00a | 12.76 | 12.12 | -514.8 | 27,841 |
| 117.00a | 12.95 | 12.12 | -514.8 | 27,841 |
| 118.19a | 13.00 | 12.47 | -515.6 | 28,454 |
| 120.00a | | 13.04 | -516.1 | 29,388 |
| 120.00a | 3.15* | 13.04 | -519.3 | 29,388 |
| 123.00a | | 14.00 | -518.1 | 30,946 |
| 123.00a | 4.30* | 14.00 | -524.7 | 30,946 |
| 123.00a | | 14.00 | -518.1 | 30,946 |
| 123.00a | 2.30* | 14.00 | -524.7 | 30,946 |
| 126.00a | | 14.96 | -521.0 | 32,516 |
| 126.00a | 4.00* | 14.96 | -525.0 | 32,516 |
| 127.75a | 13.37 | 15.52 | -521.6 | 33,432 |
| 130.00a | 13.45 | 16.26 | -516.1 | 34,600 |
| 130.00a | 12.25 | 16.26 | -516.0 | 34,600 |
| 135.70a | 12.44 | 18.12 | -488.4 | 37,469 |
| 135.70a | 12.50 | 18.12 | -488.4 | 37,469 |
| 136.45a | 12.53 | 18.37 | -484.1 | 37,834 |
| 136.45a | 18.91 | 18.37 | -484.1 | 37,834 |
| 136.50a | 18.91 | 18.38 | -484.2 | 37,858 |

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| LOCATION Ft | WEIGHT LT/Ft | BUOYANCY LT/Ft | SHEAR LT | MOMENT LT-Ft |
|---|---|---|---|---|
| 136.50a | 18.70 | 18.38 | -484.2 | 37,858 |
| 137.00a | | 18.55 | -484.3 | 38,101 |
| 137.00a | 10.00* | 18.55 | -494.3 | 38,101 |
| 137.32a | 18.73 | 18.65 | -494.3 | 38,256 |
| 146.88a | 19.04 | 21.71 | -481.9 | 42,949 |
| 152.00a | | 23.21 | -464.7 | 45,376 |
| 152.00a | 15.55* | 23.21 | -480.3 | 45,377 |
| 153.00a | | 23.50 | -476.1 | 45,855 |
| 153.00a | 1.00* | 23.50 | -477.1 | 45,855 |
| 156.44a | 19.27 | 24.50 | -460.7 | 47,470 |
| 166.00a | 19.45 | 26.85 | -400.3 | 51,604 |
| 170.24a | 19.03 | 27.62 | -366.4 | 53,233 |
| 170.24a | 19.13 | 27.62 | -366.4 | 53,233 |
| 171.97a | 18.97 | 27.93 | -351.3 | 53,854 |
| 171.97a | 12.59 | 27.93 | -351.3 | 53,854 |
| 172.00a | 12.58 | 27.94 | -350.9 | 53,865 |
| 172.00a | 12.83 | 27.94 | -350.9 | 53,865 |
| 175.00a | 12.54 | 28.48 | -304.3 | 54,849 |
| 175.00a | 13.00 | 28.48 | -304.3 | 54,849 |
| 175.57a | 12.95 | 28.59 | -295.5 | 55,018 |
| 175.57a | 12.95 | 28.59 | -295.4 | 55,020 |
| 180.00a | | 29.06 | -224.7 | 56,174 |
| 180.00a | 4.10* | 29.06 | -228.8 | 56,174 |
| 185.13a | 12.59 | 29.61 | -143.4 | 57,132 |
| 191.00a | | 29.75 | -42.3 | 57,680 |
| 191.00a | 45.80* | 29.75 | -88.1 | 57,680 |
| 194.69a | 12.16 | 29.83 | -23.3 | 57,887 |
| 195.00a | | 29.82 | -17.9 | 57,893 |
| 195.00a | 3.30* | 29.82 | -21.2 | 57,893 |
| 198.00a | | 29.63 | 31.6 | 57,878 |
| 198.00a | 1.90* | 29.63 | 29.7 | 57,878 |
| 199.40a | 12.12 | 29.55 | 54.1 | 57,820 |
| 199.40a | 12.05 | 29.55 | 54.1 | 57,820 |
| 200.00a | | 29.51 | 64.6 | 57,784 |
| 200.00a | 4.30* | 29.51 | 60.3 | 57,784 |
| 201.00a | 12.03 | 29.45 | 77.8 | 57,716 |
| 201.00a | 11.67 | 29.45 | 77.8 | 57,716 |
| 202.00a | 11.67 | 29.39 | 95.5 | 57,629 |
| 202.00a | 12.11 | 29.39 | 95.5 | 57,629 |
| 204.25a | 12.09 | 29.26 | 134.3 | 57,371 |
| 205.00a | 12.00 | 29.15 | 147.2 | 57,266 |
| 205.00a | 11.54 | 29.15 | 147.2 | 57,266 |
| 212.00a | | 28.12 | 269.5 | 55,808 |
| 212.00a | 3.15* | 28.12 | 266.4 | 55,808 |
| 215.00a | 10.43 | 27.68 | 318.3 | 54,932 |
| 215.00a | 11.33 | 27.68 | 315.8 | 54,932 |
| 215.00a | | 27.68 | 315.8 | 54,932 |
| 215.00a | 2.50* | 27.68 | 315.8 | 54,932 |
| 215.24a | 11.31 | 27.65 | 319.6 | 54,858 |

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GHS 6.38D CPCX

| LOCATION Ft | WEIGHT LT/Ft | BUOYANCY LT/Ft | SHEAR LT | MOMENT LT-Ft |
|---|---|---|---|---|
| 215.24a | 11.31 | 27.65 | 319.7 | 54,856 |
| 216.00a | | 27.48 | 332.1 | 54,609 |
| 216.00a | 4.10* | 27.48 | 328.0 | 54,609 |
| 222.00a | | 26.13 | 421.6 | 52,358 |
| 222.00a | 30.00* | 26.13 | 391.6 | 52,358 |
| 225.00a | | 25.46 | 435.7 | 51,118 |
| 225.00a | 3.20* | 25.46 | 432.5 | 51,117 |
| 226.22a | 10.99 | 25.18 | 450.0 | 50,579 |
| 228.90a | 10.97 | 24.40 | 487.0 | 49,324 |
| 228.90a | 11.25 | 24.40 | 487.0 | 49,324 |
| 229.44a | 11.24 | 24.25 | 494.1 | 49,057 |
| 230.00a | 11.24 | 24.08 | 501.3 | 48,781 |
| 230.00a | 9.88 | 24.08 | 501.3 | 48,781 |
| 230.50a | 9.87 | 23.94 | 508.4 | 48,529 |
| 230.50a | 16.25 | 23.94 | 508.4 | 48,529 |
| 237.21a | 16.17 | 21.99 | 553.7 | 44,963 |
| 241.00a | | 20.74 | 573.5 | 42,824 |
| 241.00a | 36.50* | 20.74 | 537.0 | 42,824 |
| 248.00a | | 18.42 | 561.8 | 38,971 |
| 248.00a | 15.55* | 18.42 | 546.2 | 38,971 |
| 248.19a | 15.97 | 18.36 | 546.7 | 38,867 |
| 250.00a | | 17.71 | 550.6 | 37,875 |
| 250.00a | 4.10* | 17.71 | 546.5 | 37,874 |
| 259.17a | 14.59 | 14.43 | 554.8 | 32,812 |
| 259.17a | 14.59 | 14.43 | 554.8 | 32,810 |
| 264.32a | 15.04 | 12.57 | 548.1 | 29,969 |
| 264.32a | 14.22 | 12.57 | 548.1 | 29,969 |
| 266.00a | 14.44 | 11.96 | 544.6 | 29,051 |
| 266.00a | 8.06 | 11.96 | 544.6 | 29,051 |
| 266.32a | 8.10 | 11.84 | 545.8 | 28,877 |
| 266.32a | 12.76 | 11.84 | 545.8 | 28,877 |
| 270.00a | 12.90 | 10.51 | 539.7 | 26,879 |
| 270.00a | 13.36 | 10.51 | 534.7 | 26,879 |
| 270.00a | | 10.51 | 534.7 | 26,879 |
| 270.00a | 5.00* | 10.51 | 534.7 | 26,879 |
| 270.16a | 13.36 | 10.46 | 534.3 | 26,793 |
| 275.00a | | 8.78 | 517.5 | 24,247 |
| 275.00a | 9.60* | 8.78 | 507.9 | 24,247 |
| 281.14a | 12.13 | 6.64 | 478.6 | 21,216 |
| 281.14a | 12.13 | 6.64 | 478.5 | 21,214 |
| 288.00a | | 4.55 | 440.1 | 18,066 |
| 288.00a | 6.10* | 4.55 | 434.0 | 18,066 |
| 292.13a | 9.16 | 3.29 | 410.1 | 16,324 |
| 293.36a | 8.89 | 3.01 | 402.8 | 15,823 |
| 294.50a | 8.66 | 2.75 | 396.1 | 15,369 |
| 294.50a | 9.46 | 2.75 | 396.1 | 15,369 |
| 297.00a | 8.93 | 2.18 | 379.3 | 14,401 |
| 297.00a | 8.01 | 2.18 | 379.3 | 14,401 |
| 300.00a | | 1.50 | 361.7 | 13,290 |

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GHS 6.38D

CPCX

| LOCATION Ft | WEIGHT LT/Ft | BUOYANCY LT/Ft | SHEAR LT | MOMENT LT-Ft |
|---|---|---|---|---|
| 300.00a | 5.00* | 1.50 | 356.7 | 13,290 |
| 303.11a | 6.72 | 0.79 | 338.4 | 12,210 |
| 311.26a | 6.08 | 0.00 | 289.4 | 9,654 |
| 314.09a | 5.86 | | 272.5 | 8,859 |
| 323.00a | 5.19 | | 223.3 | 6,657 |
| 323.00a | 5.04 | | 223.3 | 6,657 |
| 323.30a | 5.02 | | 221.8 | 6,590 |
| 323.30a | 3.56 | | 221.8 | 6,590 |
| 324.00a | 3.54 | | 219.3 | 6,436 |
| 324.00a | 3.36 | | 219.3 | 6,436 |
| 325.08a | 3.34 | | 215.7 | 6,202 |
| 336.06a | 3.11 | | 180.3 | 4,033 |
| 347.05a | 2.89 | | 147.3 | 2,239 |
| 358.03a | 2.68 | | 116.7 | 795 |
| 360.00a | | | 111.4 | 570 |
| 360.00a | 56.80* | | 54.6 | 570 |
| 369.02a | 2.49 | | 31.5 | 186 |
| 378.00a | | | 9.7 | 4 |
| 378.00a | 5.05* | | 4.7 | 4 |
| 380.00a | 2.32 | | -0.0 | 0 |
| 380.00a | 0.00 | | | |

* Point weight in LONG TONS------------------------------

S U M M A R Y

Largest Shear: 573.5 LT at 241.00a
Largest Bending Moment: 57,893 LT-Ft at 195.00a (Hogging)

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